2009 University of New Hampshire Research Plan of Work

I. Plan Overview

1. Brief Summary about Plan Of Work

The New Hampshire Agricultural Experiment Station (NH-AES) resides within the University of New Hampshire College of Life Sciences and Agriculture. It has the responsibility for Hatch, McIntire Stennis, Animal Health, and Multi State Research Programs. This Plan of Work does not include New Hampshire Cooperative Extension, which is a separate administrative unit in New Hampshire. However, there is effective coordination of appropriate programs between the two units. Through the COLSA Agriculture Strategic Planning Committee and the NH-AES Advisory Committee, we are working to facilitate constituent input, to focus our research on priority issues and to improve our delivery of research findings to end users. The goal of our planned programs is to provide both basic and applied research to support increased knowledge to address state and regional agricultural issues, and to improve production, marketing and processing of regional agricultural products. The New Hampshire AES has established as an outcome indicator increasing the effectiveness of basic and applied projects related to New Hampshire (NH) agricultural needs. Additionally, we use the increase in agricultural production in New Hampshire and income growth to New Hampshire farm operations as indicators. Based on the most recent data available from the USDA's New England Agricultural Statistics Service, the number of NH farms remained stable at 3400 between 2003 and 2006 compared to 2800 farms in 1995. In 2006, total land in acres was 450,000 with the average size farm of 132 acres compared to the average size farm in 1996 of 145 acres. Between 2003 and 2007, the agricultural sector contribution to the State's Economy increased from $195 to $ 554 million in direct sales of agricultural and other horticulture products and services. The largest segment is ornamental horticulture, which accounts for $381 million. We continue our philosophy that the mission of the Agricultural Experiment Station is greater than solely enhancing production agriculture and thus support basic and applied sciences that help position NH to 1) develop new agricultural products and jobs, 2) augment farm based and farm related industry, 3) provide opportunities for non-traditional and sustainable farming endeavors such as the Organic Dairy, and 4) create opportunities for farm and rural community development. Each of these areas contributes to the development of a highly competitive and sustainable agricultural system for local, regional and global markets. The NH Agricultural Experiment Station supports the following basic and applied projects to create technology and research for the benefit of the state, region and nation. We believe these projects provided valuable results, excellent return on the investment of AES funds, and a strategic position for the NH AES to successfully achieve our goals. The research findings, developments and technologies are and will be transferred through various mechanisms including classroom, laboratory and field instruction, stakeholder workshops, publications, presentations at regional, national and international scientific meetings, websites, web portals and genomic data banks, technology transfer, and policy recommendations.

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2009	0.0	0.0	23.1	0.0
2010	0.0	0.0	23.1	0.0
2011	0.0	0.0	23.1	0.0
2012	0.0	0.0	23.1	0.0
2013	0.0	0.0	23.1	0.0

II. Merit Review Process

1. The Merit Review Process that will be Employed during the 5-Year POW Cycle

● Internal University Panel

● Expert Peer Review

2. Brief Explanation

The UNH College of Life Sciences and Agriculture (COLSA) is developing an Agricultural Strategic Plan (ASP) to facilitate the integration of agricultural teaching, research and outreach programs. One outcome of the strategic planning process will be the identification of a set of priority areas for research emphasis. The NHAES has an External Advisory Committee, representing a diverse group (16 members) of stakeholders including representatives from industry, university and state and federal government. The External Advisory Committee has been involved in the COLSA ASP process. The group also meets twice per year to exchange ideas for increasing this station's effectiveness in serving stakeholders and the citizens of our state. The ASP and External Advisory Committee input will be used to gauge the relevance of AES project proposals. The merit review process for new research projects starts with a 6 page proposal that is reviewed by three to five external peer reviewers followed by a review by an internal AES Project Review Panel composed of five faculty members from our college. The peer review process is as follows: There is an initial meeting with the NHAES and investigator to discuss the proposed project. If feasible and relevant to Station research priorities, the investigator is encouraged to submit a proposal. Upon receipt of each project proposal that has been endorsed by the department chair, NHAES reviews it relative to its appropriateness to the research mission, goals and programs of the NHAES and overall feasibility of performing the research. When a proposal meets these requirements, the proposal along with the peer review form is then sent to five external reviewers. The reviewers are asked to rate the proposal on scientific merit and relevence to the NHAES. The review form has 4 specific areas for numeric ratings and written comments. Reviews are sent to the investigator who is asked to response to the reviews and/or modify the proposal. Modified proposal along with the external reviews are sent to three of the five internal AES Project Review Panel members. The committee is asked to rank the proposals in each of the following areas: applicability to NHAES priorities and state and regional problems; scientific and technical merit; rationale of objectives and procedures; probability of success; previous year's progress report or productivity. When a project receives generally favorable ratings by both the external peer review and by the AES Project Review Panel, the project is approved as a NHAES project and submitted for CSREES approval.

III. Evaluation of Multis & Joint Activities

1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

The UNH College of Life Sciences and Agriculture (COLSA) is in the process of developing an Agricultural Strategic Plan (ASP) to facilitate the integration of agricultural teaching, research and outreach programs. The ASP Committee is collecting input from an exhaustive list of internal and external stakeholders from the state and region. The methods in direct meetings and listening session, workshops and site visits. The NHAES also has an Internal (UNH) and an External Advisory Committee that meets on a regular basis. Input from all these sources will be used to develop and continually update a set of priority areas for NHAES research. These priorities will be described in the annual RFP for NHAES projects. Proposals that address these priority issues will receive higher scores in the merit review process.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?

Under-served and under-represented populations of the state are being identified as part of the NHAES prioritization process and the UNH COLSA Agricultural Strategic Plan. A proactive process is being established to actively encourage project proposals that address these groups. One example of ongoing Hatch Project addressing this group is aimed at increasing the intake of fruits, vegetables and whole grains in older adults of the state.

3. How will the planned programs describe the expected outcomes and impacts?

The Principle Investigators of all NHAES project are asked to complete annual web-based Plan of Work questionnaires. Several questions address the expected outcomes of their individual projects. The expected outcomes statements from individual projects are synthesized into a summary of expected outcomes for a planned program. Investigators report their actual outcomes in their annual reports (AD-421) and this information is summarized for each planned program in the station Annual Report. In general, changes in knowledge related to individual projects are described to stakeholders through publications (peer reviewed and otherwise), workshops, presentations at scientific meetings, websites and traditional media (radio, television, newspapers). For research projects, impacts are frequently harder to assess as they develop over time. Changes in condition and changes in action can sometimes be described for applied research projects. For example, if a vegetable breeding program develops a new variety of more nutritious and better quality squash and the variety is produced by a seed company. A measurable change in condition might be the availability of that variety to commercial growers and home gardeners. A change in action might be that growers and gardeners decide to grow it. These outcomes can be described, but are not always easy to quantify. Changes in condition and actions from basic research frequently take some time to develop and can be difficult to assess and or quantify.

4. How will the planned programs result in improved program effectiveness and/or efficiency?

In recent years, the NHAES has had a very diverse research portfolio. While the individual projects can be clustered into the broader themes of the planned programs, they have not been related closely enough to generated synergy. By developing a dynamic set of NHAES priorities and tailoring the annual RFPs to target these areas, we hope to significantly increase our program efficiency and effectiveness.

IV. Stakeholder Input

1. Actions taken to seek stakeholder input that encourages their participation

- Survey of traditional stakeholder groups
- Survey of selected individuals from the general public
- Other (Request comments from proposal reveiwers)
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to traditional stakeholder groups
- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder groups

Brief explanation.

Input from stakeholders to help establish program priorities is encouraged by presentations and meetings with traditional and non-traditional stakeholder groups. Traditional stakeholders are generally very interested in the work done by the NHAES and are most willing to offer input and suggestions on what the AES can do that would help them. In most cases, the only action required is to meet with them or contact them in some other way.

Input from stakeholders in individual NHAES projects is encouraged in a wide variety of ways including surveys (telephone, in person, and web based), through presentations at scientific conferences, through educational workshops, through multistate project meetings, via mass media, through publications, through the university classroom and educational programs aimed at K-12.

2(A). A brief statement of the process that will be used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Open Listening Sessions
- Use Advisory Committees
- Other (UNH Cooperative Extension)

Brief explanation.

The NHAES is a participant in the UNH COLSA Agriculture Strategic Planning process; it is a significant effort and an ongoing process. Stakeholder input is being sought to help shape and strengthen the future of agricultural teaching, research and outreach programs in the College. UNH Cooperative Extension and the NH Department of Agriculture and the NHAES External Advisory Committee have been extremely helpful in identifying both traditional and non-traditional stakeholders. Meetings with one group of stakeholders generally results in the identification of additional stakeholders groups. Attendance and presentations at agricultural exhibition, such as the annual NH Farm & Forest Expo, facilitates conversations with a very diverse group of stakeholders. Listening to and speaking with participants in Cooperative Extension sponsored conferences and workshops has provide insights from growers groups, professionals, government agencies, home gardeners and may others.

2(B). A brief statement of the process that will be used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting specifically with non-traditional individuals
- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Meeting specifically with non-traditional groups
- Meeting with invited selected individuals from the general public
- Survey of traditional Stakeholder individuals
- Survey of traditional Stakeholder groups
- Survey of the general public
- Meeting with the general public (open meeting advertised to all)
- Survey of selected individuals from the general public

Brief explanation

For Agriculture Strategic Planning and development of NHAES programs and priorities, input is collected primarily through meetings with traditional stakeholder groups and individuals including growers, farmers, agricultural councils, state and federal agency representatives, neighboring state AES administrators, research project directors, graduate and undergraduate students, the AES internal and external advisory committees and so forth. While most meetings are open discussions, some are NHAES presentations followed by questions and answer sessions. The NHAES administration also attends many UNH Cooperative Extension workshops, meeting with growers, farmers and producers and takes advantage of opportunities to participate in discussions with groups and individuals. The UNH College of Life Science and Agriculture and NHAES are completely overhauling the Agriculture section of the College website to make Agriculture much more visible. It will feature a stakeholder input section. When it is ready, we will use an email campaign to stakeholders including everyone in "Who's Who in New Hampshire Agriculture" to direct people to the site and input opportunities.

NHAES research projects also collect input from stakeholders via a variety of methods. Projects with social science components frequently use questionnaires. For example, a new project examining the benefits and costs of natural resource policies affecting public and private lands will conduct focus groups, individual pretests, and request survey review via email. The results of this work will go into designing a survey that will go out to homeowners in New Hampshire and Maine. Stakeholder input to most of the basic science and some of the applied projects is primarily in the form of comments from reviewers of proposals and manuscripts and from questions, comments and discussions following presentations at regional, national and international scientific conferences. Stakeholder input for many of the applied projects is collected trough comments and questions at workshops and training sessions for the end users.

3. A statement of how the input will be considered

- Other (Strategic Plan Development)
- In the Action Plans
- In the Staff Hiring Process
- To Set Priorities
- Redirect Research Programs
- In the Budget Process
- To Identify Emerging Issues

Brief explanation.

Stakeholder input collected through the Agriculture Strategic Planning (ASP) process, from NHAES advisory groups, and other sources will be used to establish research priority areas. Future RFP for NHAES projects will target new projects and focus resources in those areas. Likewise, infrastructure investments will be guided by the ASP, which in turn is heavily influenced by stakeholder input. The ASP and the research priorities are both dynamic and will evolve continually with influence from stakeholders. The ASP will also identify areas of investment for strategic hires of research and teaching faculty, again this process is guided by stakeholder needs.

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Agricultural Systems
2	Animals & Animal Products
3	Biotechnology & Genomics
4	Economics & Commerce
5	Food, Nutrition & Health
6	Natural Resources & Environment
7	Pest Management
8	Plants & Plant Products
9	Sustainable Horticulture
10	Sustainable Marine Aquaculture & Fisheries

V(A). Planned Program (Summary)

Program #1

1. Name of the Planned Program

Agricultural Systems

2. Brief summary about Planned Program

The overall goal of the program is take a whole-system view of agriculture and to facilitate economic and environmental sustainability. The program currently has two projects. A new project, but a logical extension of an earlier one, will examine university farms and town agricultural commissions as infrastructural bases for agricultural sustainability in New England. A basic hypothesis of the study is that Land Grant University farms have a critical role to play in the ensuring the sustainability of local agriculture and the security of a food supply now and for the future. A second hypothesis is that town agricultural commissions are needed to help with community planning, again to ensure a food-secure future. The second project is a systems-view approach to the dairy enterprise management to improve economic and environmental sustainability.

3. Program existence :   Intermediate (One to five years)

4. Program duration :   Long-Term (More than five years)

5. Expending formula funds or state-matching funds :   Yes

6. Expending other than formula funds or state-matching funds :   Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
131	Alternative Uses of Land			7%	
302	Nutrient Utilization in Animals			37%	
305	Animal Physiological Processes			7%	
307	Animal Management Systems			10%	
311	Animal Diseases			3%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and (			3%	
315	Animal Welfare/Well-Being and Protection			3%	
401	Structures, Facilities, and General Purpose Farm Supplies			3%	
601	Economics of Agricultural Production and Farm Management			7%	
608	Community Resource Planning and Development			17%	
903	Communication, Education, and Information Delivery			3%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

There is an on-going renaissance in local food and farming in New England and the linkage of this renaissance with food systems/food markets in the region constitutes an important area of study for the land grant university. The northern New England land grant universities (VT, NH, MA and ME) were all formerly major players in New England agriculture. The region has a need for their services again, in both small-scale sustainability and agroecological food production (fruits, vegetables, grains, dairy and meat products), and in the development research and processing infrastructure and marketing systems within the region. The reestablishment of a permanent, sustainable agriculture in New England is a critical priority and it is predicated on the availability of the appropriate infrastructure.

Dairy operations in New England are facing unprecedented increase in the cost of energy and feed. For economic survival and ecological sustainable dairy operations must optimize their use of energy, feed and all other resources. Optimization of nutrition for milk production and quality in lactating cows and for growth and health of calves and heifers requires research. It is a priority of the NHAES to carry out research and demonstrate the implementation of economically and environmentally sustainable methods of dairy management. One aspect of the project is to characterize the feeding value and protein digestibility of distiller's grain, a by-product of ethanol production that is suitable for lactating dairy cows when fed in moderation.

2. Scope of the Program

- In-State Extension
- Multistate Research
- In-State Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension
- Multistate Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

-
The need for sustainable agriculture and locally produced food is critical and consumer demand will continue to increase.
-
Support for land grant university farms will continue
-
New England farms and especially dairy farms will face increase economic and environmental sustainability issues
-
Land grant colleges research programs are crucial in developing solutions for farm survival
-
Optimizing calf nutrition will improve growth and therefore profitability by possibly having calves attain breeding size sooner.
-
Large amounts of distiller's grains will continue to be produced from corn and fed to dairy cows.
-
More precise matching of nutrient supply with nutrient requirements results in more efficient and profitable milk production and more environmentally sustainable feeding practices.
-
More intensive feed analysis is needed to support advances in computer-based nutrition models.

2. Ultimate goal(s) of this Program

The ultimate goals of the program are 1) to identify future opportunities for land grant universities to serve the food secutiy need of the people of New England and 2) to carry out research that enhances our knowledge and leads to the economic success and environmental sustainability of farming and agriculture in New England.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2009	0.0	0.0	1.4	0.0
2010	0.0	0.0	1.4	0.0
2011	0.0	0.0	1.4	0.0
2012	0.0	0.0	1.4	0.0
2013	0.0	0.0	1.4	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

There are currently two projects in this program. The first project will identify future opportunities for land grant university farms and town agricultural commission to serve the food security needs of the people in New England. Though visits, interviews, studying master plans and documents, the university farms of the six New England land grant universities will be inventoried, assessed and described, with particular emphasis on New Hampshire and the surrounding states of Maine, Vermont and Massachusetts. The project will study and assess the work and accomplishments, thus far, of existing town agricultural commission in New Hampshire and Massachusetts. Through assessment of the minutes of town meeting their activities will be compared with the intent of their enabling statutes and the principles and practices of sustainable agriculture. The second project is part of a regional effort develop management systems to improve the economic and environmental sustainability of dairy enterprises. There are two components of the project at the NHAES. The first will use the UNH research dairy and laboratory analyses to conduct in vitro and in situ assays to quantify amino acid availability in distiller's grains, and in vivo assays to evaluate lysine and methionine as modifiers of rumen fermentation, in lactating dairy cows. Data will be disseminated to researchers in ruminant nutrition, developers of ruminant nutrition software programs, and dairy nutritionists and farmers, via published manuscripts, conference presentations and publications, and workshops and seminars. The second part of the project will use the research dairy herd and laboratory analyses to study the effects colostrum replacers, essential oils and pasturing on heifer and calf growth.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
- Education Class - Demonstrations - Other 2 (Presentations at meetings) - Other 1 (Field and Lboratory Research)	- Web sites - Other 1 (Peer Reviewed Publications)

3. Description of targeted audience

The target audience for the first project includes land grant universities and their AESs, researchers, farm managers, and student; town governments; town, state and national agricultural commissions and agencies; farmers, food producers and processors; citizens and consumers. The target audience for the dairy management projects include dairy nutritionists, dairy farmers, and scientists in dairy nutrition.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

Year	Direct Contacts Adults Target	Indirect Contacts Adults Target	Direct Contacts Youth Target	Indirect Contacts Youth Target
2009	1000	2000	50	100
2010	1000	2000	50	100
2011	50	100	50	100
2012	50	100	50	100
2013	50	100	0	100

2. (Standard Research Target) Number of Patent Applications Submitted

Expected Patent Applications

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	2	0	2
2010	2	0	2
2011	1	0	1
2012	1	0	1
2013	1	0	1

V(H). State Defined Outputs

1. Output Target

- Number of participants in the project (not including audience counts)

  2009 : 8   **2010 :** 8   **2011 :** 7   **2012 :** 7   **2013 :** 7

- Number of undergraduate students directly involved in the projects

  2009 : 3   **2010 :** 3   **2011 :** 3   **2012 :** 3   **2013 :** 3

- Number of graduate student directly involved in the projects

  2009 : 2   **2010 :** 2   **2011 :** 1   **2012 :** 1   **2013 :** 1

- Number of university courses in which project results have been incorporated

  2009 : 3   **2010 :** 3   **2011 :** 2   **2012 :** 2   **2013 :** 2

- Number of workshops and training sessions

  2009 : 1   **2010 :** 1   **2011 :** 1   **2012 :** 1   **2013 :** 1

- Number of presentation at regional, national, or international scientific meetings

| **2009** : 4 | **2010** : 4 | **2011** : 2 | **2012** : 2 | **2013** : 2 |

- Number of book chapters written

| **2009** : 0 | **2010** : 2 | **2011** : 8 | **2012** : 0 | **2013** : 0 |

- Number of non-peer-reviewed publications (abstracts, newsletters, fact sheets, articles, etc)

| **2009** : 3 | **2010** : 3 | **2011** : 3 | **2012** : 3 | **2013** : 3 |

- Number of websites in which project results have been incorporated

| **2009** : 2 | **2010** : 2 | **2011** : 2 | **2012** : 2 | **2013** : 2 |

V(I). State Defined Outcome

O. No	Outcome Name
1	Increased knowledge of the land grant farm infrastructure in New England (qualitative outcome statement)
2	Increased knowledge of the number and activities of town agriculture commissions in New Hampshire and Massachusetts (qualitative outcome statement)
3	Increase knowledge of the protein composition of distiller's grain and it nutritional value for lactating dairy cows (qualitative outcome statement)
4	Increased utilization of distiller's grain by New England dairy farmers (qualitative outcome statement)
5	Increased knowledge of optimal practices for promoting growth and health of calves and heifers (qualitative outcome statement)
6	Overall enhancement of knowledge and methods of the support of sustainable agricultural systems in New Hampshire and the region (qualitative outcome statement)

Outcome #1

1. Outcome Target

Increased knowledge of the land grant farm infrastructure in New England (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

   2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 131 - Alternative Uses of Land

- 307 - Animal Management Systems

- 601 - Economics of Agricultural Production and Farm Management

- 608 - Community Resource Planning and Development

- 903 - Communication, Education, and Information Delivery

Outcome #2

1. Outcome Target

Increased knowledge of the number and activities of town agriculture commissions in New Hampshire and Massachusetts (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

   2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 131 - Alternative Uses of Land

- 601 - Economics of Agricultural Production and Farm Management

- 608 - Community Resource Planning and Development

- 903 - Communication, Education, and Information Delivery

Outcome #3

1. Outcome Target

Increase knowledge of the protein composition of distiller's grain and it nutritional value for lactating dairy cows (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

   2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals

- 305 - Animal Physiological Processes

- 307 - Animal Management Systems

- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals

- 315 - Animal Welfare/Well-Being and Protection

- 601 - Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Target

Increased utilization of distiller's grain by New England dairy farmers (qualitative outcome statement)

2. Outcome Type :   Change in Action Outcome Measure

| **2009 :** 0 | **2010 :** 0 | **2011 :** 0 | **2012 :** 0 | **2013 :** 0 |

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals

- 305 - Animal Physiological Processes

- 307 - Animal Management Systems

- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals

- 315 - Animal Welfare/Well-Being and Protection

- 401 - Structures, Facilities, and General Purpose Farm Supplies

- 601 - Economics of Agricultural Production and Farm Management

- 903 - Communication, Education, and Information Delivery

Outcome #5

1. Outcome Target

Increased knowledge of optimal practices for promoting growth and health of calves and heifers (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

| **2009 :** 0 | **2010 :** 0 | **2011 :** 0 | **2012 :** 0 | **2013 :** 0 |

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals

- 305 - Animal Physiological Processes

- 307 - Animal Management Systems

- 311 - Animal Diseases

- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals

- 315 - Animal Welfare/Well-Being and Protection

- 601 - Economics of Agricultural Production and Farm Management

<u>Outcome #6</u>

1. Outcome Target

Overall enhancement of knowledge and methods of the support of sustainable agricultural systems in New Hampshire and the region (qualitative outcome statement)

2. Outcome Type :   Change in Condition Outcome Measure

| **2009 :** 0 | **2010 :** 0 | **2011 :** 0 | **2012 :** 0 | **2013 :** 0 |

3. Associated Institute Type(s)

• 1862 Research

4. Associated Knowledge Area(s)

● 131 - Alternative Uses of Land

● 302 - Nutrient Utilization in Animals

● 305 - Animal Physiological Processes

● 307 - Animal Management Systems

● 311 - Animal Diseases

● 314 - Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals

● 315 - Animal Welfare/Well-Being and Protection

● 401 - Structures, Facilities, and General Purpose Farm Supplies

● 601 - Economics of Agricultural Production and Farm Management

● 608 - Community Resource Planning and Development

● 903 - Communication, Education, and Information Delivery

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

● Natural Disasters (drought,weather extremes,etc.)
● Appropriations changes
● Economy

Description

For any field research in agriculture, extreme and/or anomalous weather conditions or natural disasters can produce atypical results that require changes in planned research methodology.

Change in the economy can change regional priorities and necessitate refocusing research.

The success of the research is dependent on continued NHAES funding at a sufficient level.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

● During (during program)

● Comparisons between program participants (individuals,group,organizations) and non-participants

● After Only (post program)

● Before-After (before and after program)

Description

Evaluation of work will be based on peer review acceptance of manuscripts and papers, industry acceptance and application of results. Though established networking with the dairy & feed industry, university researchers, dairy farmers, & nutrition consultants and through presentations at conferences, immediate feedback will be obtained.

2. Data Collection Methods

- Observation
- Unstructured
- Case Study

Description

Feedback from target audiences (dairy farmers, dairy nutritionists, regulatory agencies, other scientists, students, etc) will be collected through questions and comments at meetings, proposal and manuscript reviews, and website stakeholder input tools.

V(A). Planned Program (Summary)

Program #2

1. Name of the Planned Program

Animals & Animal Products

2. Brief summary about Planned Program

The NHAES Animal and Animal Product Program currently has three components comprising a total of five projects. Animal Health contains two projects: Project 1 is part of a multi-state project examining the genetic basis for resistance and immunity to avian diseases, and Project 2 is assessing mechanisms of bacterial-induced tissue responses in animals that provide protection from further bacterial super-infection. There is on project related to Animal Growth & Nutrition: Project 3 is part of an ongoing multi-state project to study the metabolic relationships in the supply of nutrients for lactating cows. Two studies pertain to Animal Reproduction: Project 4 is developing improved methods for assessing the effect of agents on the testis, and Project 5 is part of a multi-state project examining ovarian influences on embryonic survival in ruminants.

Several projects previously listed in this program have been moved to the Sustainable Marine Aquaculture and Fisheries Program, which is described later.

3. Program existence :   Mature (More then five years)

4. Program duration :   Long-Term (More than five years)

5. Expending formula funds or state-matching funds :   Yes

6. Expending other than formula funds or state-matching funds :   Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals			25%	
302	Nutrient Utilization in Animals			14%	
303	Genetic Improvement of Animals			10%	
308	Improved Animal Products (Before Harvest)			6%	
311	Animal Diseases			10%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and (			5%	
315	Animal Welfare/Well-Being and Protection			25%	
723	Hazards to Human Health and Safety			5%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Project 1: Avian disease remains a major threat to poultry production. Understanding the mechanisms of disease susceptibility or resistance will increase production efficiency and overall animal health can be improved. A priority of our investigations of the genetic control of immune responses to pathogens is to improve animal health.

Project 2: Normal microbiota present the first line of defense (innate immunity) in animals, but the mechanisms of protection are not defined. With an understanding of how these associations are permitted, we can in the future utilize probiotic approaches to prevent diseases.

Project 3: The US dairy industry is a major contributor to the diets of humans and the economic viability of rural communities. Since the introduction of the current Federal Milk Marketing Order System in January 1, 2001, protein has been the most highly valued milk component. It is a priority of this project to continue research into improving the conversion of feed protein into milk protein, decrease feed costs, reduce the potential for nitrogen pollution, and increase dairy farm profitability.

Project 4: Sperm production is an important factor influencing the reproductive capacity of the males of our economically important species. Unfortunately, spermatogenesis is extremely sensitive and may be readily disrupted by a variety of physical and chemical agents. To ensure the reproductive safety of environmental agents or proposed new animal drugs, such agents must be evaluated in experiments employing methods that are reliable and sensitive. This project will seek to improve the reliability and sensitivity of mating trials, which constitute one of the most widely used evaluation methods in current use.

Project 5: Embryonic mortality and ovarian dysfunction are major contributing factors to ruminant infertility which has a major impact on dairy producers and the agricultural economy. A priority our multi-state project is to determine ovarian and embryonic attributes of fertility in ruminants by acquiring fundamental information about the influence of oocyte quality, follicular development, corpus luteum function, and uterine environment on embryonic survival. This will lead to improved fertility and reproductive performance.

2. Scope of the Program

- In-State Research
- Integrated Research and Extension
- Multistate Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Project 1:

-

Avian disease will remains a major threat to poultry production.

-

Understanding the mechanisms of disease susceptibility or resistance will increase production efficiency.

Project 2:

-

There are universal or common mechanisms to microbial association and host protection

Project 3:

-

More precise matching of nutrient supply with nutrient requirements results in more efficient and profitable milk production and more environmentally sustainable feeding practices.

-

More intensive feed analysis is needed to support advances in computer-based nutrition models.

Project 4:

-

Spermatogenesis is impaired by a number of drugs and environmental toxins.

Project 5:

-

Environmental and metabolic influences are contributing factors of infertility and pregnancy loss in cattle.

-

Certain ovarian attributes are critical for embryonic survival.

2. Ultimate goal(s) of this Program

The ultimate goal of the NHAES Animal & Animal Products program is to provide scientific knowledge that will to healthier animals and more efficient production, which in turn will ensure the economic stability and long-term sustainability of agriculture in New Hampshire and the region. Specific project goals are as follows:

Project 1:

-

To discover important genetic mechanisms of disease resistance

-

To improve animal health and production efficiency

Project 2:

-

To determine the mechanism of microbial association and host protection

Project 3:

-

To improve the efficiency of milk and milk protein production by more precise formulation of dairy cattle diets for protein and thus, promote greater environmental and economic sustainability in the US dairy industry

Project 4:

-

To develop more efficient methodology for assessing the effect of drugs and environmental chemicals on male animal reproductive fertility

Project 5:
•
The ultimate goal is to decrease embryonic mortality and improve reproductive performance in dairy cows

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2009	0.0	0.0	2.4	0.0
2010	0.0	0.0	2.4	0.0
2011	0.0	0.0	2.4	0.0
2012	0.0	0.0	2.4	0.0
2013	0.0	0.0	2.4	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Project 1: Through collaborative work with other institutions, conduct animal experiments and laboratory studies to examine the genetics of antibody response and disease resistance in poultry. Results will be presented at multi-state and national meetings and published in peer-reviewed journals.

Project 2: Standard laboratory assays will be performed to follow responses following reintroduction of pathogens in animal subjects. Results will be presented at scientific meetings and published in peer-reviewed journals.

Project 3: In vitro, in situ and in vivo assays will be conducted to quantify amino acid availability from distiller's grain in lactating dairy cow diets. Results will be disseminated to researchers in ruminant nutrition, developers of nutrition software programs, and dairy nutritionists and farmers via published manuscripts, conference presentations and publications, and workshops and seminars.

Project 4: Laboratory and animal experiments will be performed to test the effects of drugs on male rat fertility. After mating trials have occurred, male rats will be sacrificed and their tissues processed to enable determination of the numbers of sperm received per mated female. Mated females will be sacrificed to permit determination of pregnancy rates, litter size and numbers of fetal resorptions. Results will be published in a peer-reviewed journal.

Project 5: Laboratory experiments will be conducted with the corpus luteal endothelial cells, which line the microvasculature of the cow ovary. Tissue will be collected from cows over an extended time period. Magnetic beads will be used to isolate endothelial cells and flow cytometry to distinguish them through expression of cytoskeletal proteins and adhesion molecules. Then, microarray analysis will be performed to profile genetic attributes of these endothelial cell subtypes. Results will be presented at scientific meetings, national conferences, and in peer-reviewed journals.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
• Demonstrations • Education Class • Other 2 (Present at scientific meetings) • Workshop • Other 1 (Laboratory & Field Research)	• Web sites • Other 1 (Peer reviewed publications)

3. Description of targeted audience

The target audience for the basic research components of the program include other scientists in the discipline, graduate and

undergraduate students. The applied research components are also important to poultry breeders and producers, dairy farmers and dairy nutritionists.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2009	350	1150	50	25
2010	350	1150	50	25
2011	250	650	50	25
2012	250	550	50	25
2013	250	550	50	25

2. (Standard Research Target) Number of Patent Applications Submitted

Expected Patent Applications

2009 :0　　　　**2010** :0　　　　**2011** : 0　　　　**2012** :0　　　　**2013** : 0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	8	0	8
2010	7	0	7
2011	7	0	7
2012	6	0	6
2013	6	0	6

V(H). State Defined Outputs

1. Output Target

- Number of participants in the project (not including audience counts)

  2009 :15　　　　**2010** :15　　　　**2011** : 12　　　　**2012** :12　　　　**2013** :12

- Number of undergraduate students directly involved in the projects

  2009 :5　　　　**2010** :5　　　　**2011** : 5　　　　**2012** :5　　　　**2013** :5

- Number of graduate student directly involved in the projects

  2009 :3　　　　**2010** :3　　　　**2011** : 3　　　　**2012** :3　　　　**2013** :3

- Number of university courses in which project results have been incorporated

  2009 :5　　　　**2010** :5　　　　**2011** : 5　　　　**2012** :5　　　　**2013** :5

- Number of workshops and training sessions

  2009 : 3   **2010 :** 3   **2011 :** 2   **2012 :** 2   **2013 :** 2

- Number of presentation at regional, national, or international scientific meetings

  2009 : 10   **2010 :** 9   **2011 :** 7   **2012 :** 7   **2013 :** 7

- Number of book chapters written

  2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

- Number of non-peer-reviewed publications (abstracts, newsletters, fact sheets, articles, etc)

  2009 : 10   **2010 :** 9   **2011 :** 7   **2012 :** 7   **2013 :** 7

- Number of websites in which project results have been incorporated

  2009 : 2   **2010 :** 2   **2011 :** 2   **2012 :** 2   **2013 :** 2

V(I). State Defined Outcome

O. No	Outcome Name
1	Increased knowledge of the genetic basis for resistance and immunity to avian diseases (qualitative outcome statement)
2	Increased knowledge of the mechanism of bacterial-induced tissue responses in animals that provide protection from further super-infection (qualitative outcome statement)
3	Increased knowledge of the metabolic relationships in the supply of nutrients for lactating dairy cows (qualitative outcome statement)
4	Improved methods for assessing the effect of agents on the testis (qualitative outcome statement)
5	Increased knowledge of ovarian influences on embryonic survival in ruminants (qualitative outcome statement)

<u>Outcome #1</u>

1. Outcome Target

Increased knowledge of the genetic basis for resistance and immunity to avian diseases (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0	**2010 :** 0	**2011 :** 0	**2012 :** 0	**2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 308 - Improved Animal Products (Before Harvest)
- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection

<u>Outcome #2</u>

1. Outcome Target

Increased knowledge of the mechanism of bacterial-induced tissue responses in animals that provide protection from further super-infection (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0	**2010 :** 0	**2011 :** 0	**2012 :** 0	**2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 303 - Genetic   Improvement of Animals
- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection

<u>Outcome #3</u>

1. Outcome Target

Increased knowledge of the metabolic relationships in the supply of nutrients for lactating dairy cows (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0	**2010 :** 0	**2011 :** 0	**2012 :** 0	**2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals
- 308 - Improved Animal Products (Before Harvest)
- 315 - Animal Welfare/Well-Being and Protection

Outcome #4

1. Outcome Target

Improved methods for assessing the effect of agents on the testis (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals

- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals

- 723 - Hazards to Human Health and Safety

Outcome #5

1. Outcome Target

Increased knowledge of ovarian influences on embryonic survival in ruminants (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals

- 303 - Genetic   Improvement of Animals

- 308 - Improved Animal Products (Before Harvest)

- 311 - Animal Diseases

- 315 - Animal Welfare/Well-Being and Protection

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Competing Programatic Challenges
- Economy
- Appropriations changes
- Natural Disasters (drought,weather extremes,etc.)

Description

For any field research in agriculture, extreme and/or anomalous weather conditions or natural disasters can produce atypical results that require changes in planned research methodology.

Change in the economy can change regional priorities and necessitate refocusing research.

The success of the research is dependent on continued NHAES funding at a sufficient level.

Change in NHAES research priorities through strategic planning and advisory group input might result in a rebalancing of competing programmatic investment.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)
- Time series (multiple points before and after program)
- Before-After (before and after program)

Description

Evaluation of work will be based on peer review acceptance of manuscripts and papers, industry acceptance and application of results. Though established networking with the dairy & feed industry, university researchers, dairy and poultry farmers, & nutrition consultants and through presentations at conferences, immediate feedback will be obtained.

2. Data Collection Methods

- Other (see below)
- Unstructured
- Observation
- Sampling

Description
{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program #3

1. Name of the Planned Program

Biotechnology & Genomics

2. Brief summary about Planned Program

A number of the projects that were listed in this program in previous Plans of Work have been moved to other programs such as Sustainable Horticulture and Sustainable Marine Aquaculture and Fisheries. Our goal is to develop cohesive programs that integrate basic and applied research and technology. For example, a project that uses strawberry genomics to guide a breeding program is more closely related to traditional fruit and vegetable program than it is to a genomic study of lamprey eels. We have not decreased our research in Genomics and Biotechnology, we are rather viewing them as tools used in our other programs.

We currently have three projects listed in the Biotechnology & Genomics Program. The first will develop and design gonadotropin-releasing hormone analogs as possible chemicals to sterilize fish and to determine the effects of recombinant hormone on reproductive activity. The second project will characterize the PUFS protein and its interaction with the CCR4-NOT complex as to their mechanism of action in controlling mRNA degradation in yeast. The third is a multi-PI project studies the continuum of relationships between bacteria and nematodes that range from symbiotic cooperation to attack insects to antagonism, where one partner kills the other. Fundamental mechanisms are being identified that govern these relationships with the hope to better understand and design natural biological control agents.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
135	Aquatic and Terrestrial Wildlife			10%	
205	Plant Management Systems			13%	
215	Biological Control of Pests Affecting Plants			20%	
304	Animal Genome			47%	
305	Animal Physiological Processes			10%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Project 1. Lampreys are an example of fish species that has created significant environmental problem, especially in the Great Lakes. Gaining a further understanding of GnRH, its analogs, its receptors, interactions with neurotransmitters and microencapsulation will be critical for development of novel strategies for improving and controlling reproduction of problematic fish species such lampreys.

Project 2. Characterizing conserved components involved in mRNA degradation may impact understanding as to how genes and proteins are expressed.

Project 3. Invasive pests threaten sustainable agriculture, so it is a priority to identify new sustainable biological control agents.

2. Scope of the Program

- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Project 1:

- GnRH is the master control of reproduction in all vertebrates and thus is available for various manipulations.

Project 2:

- mRNA degradation in yeast is evolutionarily conserved and related to higher eukaryotic mRNA degradation.

Project 3:

- Laboratory studies of bacterial-nematode interactions predict future utility in the field.

2. Ultimate goal(s) of this Program

The ultimate goal of the program is to develop genomic and biotechnology tools that can be applied to issues and problems affecting agriculture, which in turn will ensure the economic stability and long-term sustainability of agriculture in New Hampshire and the region. Project specific goals are as follows:

Project 1.

- One of the ultimate goals is to develop an alternate method of sterilizing male sea lampreys using a lamprey GnRH antagonist.

Project 2.

- Determine if PUF controls SUN4 mRNA degradation by binding to the SUN4 3' UTR

- Test the hypothesis that PUF5 accelerates deadenylation by recruiting the CCR4-NOT complex."

Project 3.

- To control invasive pests by understanding and harnessing natural and engineered bacterial-nematode interactions.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2009	0.0	0.0	3.0	0.0
2010	0.0	0.0	3.0	0.0
2011	0.0	0.0	3.0	0.0
2012	0.0	0.0	3.0	0.0
2013	0.0	0.0	3.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Project 1. Perform laboratory molecular, biochemical, and physiological research to analyze data and screen lamprey genome. Prepare and submit manuscript for to peer-reviewed journals for consideration. Train undergraduate and graduate students.

Project 2. Will use laboratory molecular biological techniques to study mRNA degradation in yeast.

Project 3. Will use laboratory analyses to study interactions between three different bacterial taxa and Caenorhabditis nematodes. Finding will be presented to scientific peer groups. Local extension researchers will be engaged to incorporate findings into management strategies.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
• Other 1 (Laboratory Research) • Other 2 (Present at Scientific Meetings)	• TV Media Programs • Web sites • Other 1 (Peer reviewed publications)

3. Description of targeted audience

The target audience for the basic research components of the program include other scientists in the discipline, graduate and undergraduate students. The applied research components are also important to natural resource managers, cooperative extension specialists, fisheries managers.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

Year	Direct Contacts Adults Target	Indirect Contacts Adults Target	Direct Contacts Youth Target	Indirect Contacts Youth Target
2009	500	600	25	50
2010	600	150	25	50
2011	500	600	25	50
2012	500	600	25	50
2013	500	600	25	50

2. (Standard Research Target) Number of Patent Applications Submitted

Expected Patent Applications

2009 :1	**2010** :1	**2011** : 0	**2012** :1	**2013** :1

3. Expected Peer Review Publications

.

Year	Research Target	Extension Target	Total
2009	9	0	9
2010	9	0	9
2011	5	0	5
2012	7	0	7
2013	6	0	6

V(H). State Defined Outputs

1. Output Target

- Submission of cDNA, ESTs, proteins, genes, RNA to GenBank

2009 :0	**2010** :0	**2011** : 0	**2012** :0	**2013** :0

- Number of participants in the project (not including audience counts)

2009 :12	**2010** :12	**2011** : 12	**2012** :12	**2013** :12

- Number of undergraduate students directly involved in the projects

2009 :3	**2010** :3	**2011** : 3	**2012** :3	**2013** :3

- Number of graduate student directly involved in the projects

2009 :4	**2010** :4	**2011** : 4	**2012** :4	**2013** :4

- Number of university courses in which project results have been incorporated

2009 :4	**2010** :4	**2011** : 4	**2012** :4	**2013** :4

- Number of workshops and training sessions

2009 :0   **2010** :0   **2011** : 0   **2012** :0   **2013** :0

- Number of presentation at regional, national, or international scientific meetings

2009 :10   **2010** :10   **2011** : 8   **2012** :10   **2013** :10

- Number of book chapters written

2009 :1   **2010** :1   **2011** : 1   **2012** :1   **2013** :0

- Number of non-peer-reviewed publications (abstracts, newsletters, fact sheets, articles, etc)

2009 :9   **2010** :9   **2011** : 9   **2012** :9   **2013** :9

- Number of websites in which project results have been incorporated

2009 :3   **2010** :3   **2011** : 3   **2012** :3   **2013** :3

V(I). State Defined Outcome

O. No	Outcome Name
1	Increase knowledge of endocrine control of reproduction (qualitative outcome statement)
2	Increase knowledge of the character and control of yeast regulatory genes (qualitative outcome statement)
3	Increase knowledge of the mechanisms predisposing mutualism or pathogenesis in bacterial-nematode interactions (qualitative outcome statement)
4	Overall increase in knowledge and methodology in genomics and biotechnology with application for agriculture (qualitative outcome statement)

Outcome #1

1. Outcome Target

Increase knowledge of endocrine control of reproduction (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0	**2010 :** 0	**2011 :** 0	**2012 :** 0	**2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 304 - Animal Genome
- 305 - Animal Physiological Processes

Outcome #2

1. Outcome Target

Increase knowledge of the character and control of yeast regulatory genes (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0	**2010 :** 0	**2011 :** 0	**2012 :** 0	**2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 304 - Animal Genome

Outcome #3

1. Outcome Target

Increase knowledge of the mechanisms predisposing mutualism or pathogenesis in bacterial-nematode interactions (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0	**2010 :** 0	**2011 :** 0	**2012 :** 0	**2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 205 - Plant Management Systems
- 215 - Biological Control of Pests Affecting Plants

Outcome #4

1. Outcome Target

Overall increase in knowledge and methodology in genomics and biotechnology with application for agriculture (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 135 - Aquatic and Terrestrial Wildlife

● 205 - Plant Management Systems

● 215 - Biological Control of Pests Affecting Plants

● 304 - Animal Genome

● 305 - Animal Physiological Processes

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

● Appropriations changes
● Natural Disasters (drought,weather extremes,etc.)
● Economy
● Government Regulations
● Competing Programatic Challenges

Description

For any field research, extreme and/or anomalous weather conditions or natural disasters can produce atypical results that require changes in planned research methodology.

Change in the economy can change regional priorities and necessitate refocusing research.

The success of the research is dependent on continued NHAES funding at a sufficient level.

Change in NHAES research priorities through strategic planning and advisory group input might result in a rebalancing of competing programmatic investment.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

● Time series (multiple points before and after program)
● Before-After (before and after program)
● During (during program)
● After Only (post program)

Description

Evaluation of work will be based on peer review acceptance of manuscripts and papers, industry acceptance and application of results, and through presentations at conferences, immediate feedback will be obtained.

2. Data Collection Methods

● Other (Q & A sessions)
● Sampling
● Unstructured

Description

Feedback from target audiences (other scientists, students, etc) will be collected through questions and comments at meetings, proposal and manuscript reviews, and website stakeholder input tools.

V(A). Planned Program (Summary)

Program #4

1. Name of the Planned Program

Economics & Commerce

2. Brief summary about Planned Program

    The NHAES has six studies related to Economics and Commerce. Project 1 is part of a multi-state study of the forces, responses, and impacts of sustaining local food systems in a globalizing environment. It is a collaboration with local food system stakeholders to identify high priority information needs and the forms in which information should be shared. Project 2 is engaging and communicating with the public and stakeholders of specific natural and agricultural resource management policies and programs. Project 3 is part of a multi-state study of the benefits and costs of natural resources policies affecting public and private lands. Project 4 address economic considerations in municipal solid waste disposal. Project 5 is part of a mulit-state study of rural low-income families that is tracking their well-being and function in an era of welfare reform. Project 6 is a multi-state study of changes in rural markets, governance and quality of life.

3. Program existence :   Mature (More then five years)

4. Program duration :   Long-Term (More than five years)

5. Expending formula funds or state-matching funds :   Yes

6. Expending other than formula funds or state-matching funds :   Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management			3%	
123	Management and Sustainability of Forest Resources			2%	
131	Alternative Uses of Land			5%	
134	Outdoor Recreation			3%	
402	Engineering Systems and Equipment			2%	
403	Waste Disposal, Recycling, and Reuse			7%	
404	Instrumentation and Control Systems			2%	
604	Marketing and Distribution Practices			6%	
605	Natural Resource and Environmental Economics			11%	
608	Community Resource Planning and Development			15%	
609	Economic Theory and Methods			9%	
610	Domestic Policy Analysis			5%	
703	Nutrition Education and Behavior			2%	
704	Nutrition and Hunger in the Population			6%	
801	Individual and Family Resource Management			4%	

802	Human Development and Family Well-Being			4%	
803	Sociological and Technological Change Affecting Individuals, Familie			2%	
805	Community Institutions, Health, and Social Services			2%	
901	Program and Project Design, and Statistics			1%	
903	Communication, Education, and Information Delivery			9%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Project 1. Globalization and consolidation in the food system is putting severe pressure on local food systems to remain economically viable. This project examines the effectiveness of strategies to sustain local food systems, including agriculture, marketing and retail sales in the face of globalization and consolidation.

Project 2. Successful management of natural and agricultural resources in rural America requires strategies that allow for active engagement of, and communication with, the public and stakeholders.
This project incorporates comparative research designs into applied social science research projects as opportunities arise and experiments will be designed specifically to address ambiguities in earlier results focused on engagement of, and communication with, the public and stakeholders within the context of natural and agricultural resource management policies and programs.

Project 3. New legislation on green energy has been passed, and there are new goals set for "green" energy production. As oil prices increase, the demand for alternative technologies will grow, so an assessment of current demand is useful for both government bodies and technology developers. Since residential real estate development is projected to have a profound impact on our land and resources, it is important to assess the needs and demands of future energy use.

Project 4. Waste management/disposal costs have more than tripled in the past two decades. State and local governments need economic analysis of various management options.

Project 5. Rural low income families who apply for welfare benefits must follow the same rules for employment as urban residents, but with fewer employment opportunities, with fewer resources and supports, and more barriers. Rural low income families who are employed are more likely to remain in the ranks of the working poor than their urban counterparts, with higher levels of ill-health. New Hampshire rural low-income families are no different. At issue are employment opportunities, health of family members and access to health care including mental health, and food security, in addition to the characteristics of the community in which the families reside.

Project 6. There is a growing interest among firms who outsource activities to bring those jobs back home. Rural America is a likely target location as many of the necessary skills are imbedded in rural residuals currently underemployed.This new source of employment in rural America that doesn't require relocation per se, can serve an important component in the arena of rural development and improving the lives of rural residents.

2. Scope of the Program

- In-State Extension
- Integrated Research and Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

    Project 1.

-

Local and regional food economies are both viable and desirable for sustainability.

-

Integrated approaches to agriculture, food entrepreneurship and nutrition are required for sustainability.

-

Local and regional food systems support community sustainability including economic development, natural resource management and nutrition.

    Project 2.

-

Managers and policy managers continue to recognize that effective resource management programs and policies require timely and accurate social science data to be collected from a variety of sources and communicated through various channels.

-

A basic assumption is that the public and stakeholders understand the specifics of proposed and current agricultural and natural resource programs and policies and that managers and policy makers understand what the public and stakeholders know and think about specific policies/programs and/or how these communities of interest could impact the program management or policy development process.

    Project 3.

-

We will gain a better understanding of consumer demand for sustainable, green, and energy efficient technology.

-

This information will be used for consumer education, research and development, as well as future legislative goals.

    Project 4.

-

Waste management will always be an issue, especially with increased interest in sustainable development and climate change.

    Project 5.

-

Rural low income famlies will struggle with welfare rules regarding work requirements because they have fewer employment options available to them, with little ability for advancement.

-

They also face barriers to employment (child care, transportation, poor health, etc.) with fewer resources to successfully overcome the barriers.

    Project 6.

-

That firms will respond to customer dissatifaction with many offshored activities by moving those activities back home and to rural America.

2. Ultimate goal(s) of this Program

    The ultimate goal of the program is to ensure economic sustainability, food system security, and an acceptable quality of life for the residence of New Hampshire and the region. Specific project goals are as follows:

    Project 1. To demonstrate clear, practical solutions for strengthening local food systems economically ecologically and nutritionally while building a long-term research, teaching and extension capability in the region to support sustainable food communities. This will result in enhancing the resilience of local and regional food and agriculture economies while reducing their vulnerability to national and global disruptions.

Project 2. To develop and improve two-way communication mechanisms for agencies to effectively communicate the goals, objectives, process and outcomes of proposed programs and policies, while at the same time insuring the public and stakeholder groups have the opportunity to be engaged or to participate in all stages of the program and/or policy development process.

Project 3. The ultimate goal of this project is a better understanding of consumer driven demand for energy efficient technology, so that education, legislation, development, and delivery of this technology can be optimized.

Project 4. To continue to provide local, state, and regional governments with up to date information on making informed waste management decisions.

Project 5. The goal of the project has been to describe how rural low income families manage their limited resources, and use social and community resources to support family functioning. Providing this information to policy makers to inform future policy decisions is the ultimate goal.

Project 6. To link corporate needs with community skill sets for specific target groups: 1) retired individuals wishing to work part-time; 2) caregivers in family wishing to work part time; and 3) individuals wishing to strengthen their resume in several aspects.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2009	0.0	0.0	1.3	0.0
2010	0.0	0.0	1.3	0.0
2011	0.0	0.0	1.3	0.0
2012	0.0	0.0	1.3	0.0
2013	0.0	0.0	1.3	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Project 1. The project is a collaboration with local food system stakeholders to identify high priority information needs and the forms in which information should be shared. Working together, we identify and analyze ongoing and potential forces that are maintaining or transforming the relationships between localities and their food systems and examine the diverse strategies local food system stakeholders are currently using or might use to create and manage ongoing or potential change in the food system. University programs are also developed in response to project findings. We will continue one-on-one and workshop extension support linking growers and producers with school food service programs; coordinate regional networking of farm-to-school programs; the second technician coordinates activities of the New Hampshire Center for a Food Secure Future supporting a web-based clearinghouse and network communications linking agriculture, food enterprises and nutrition.

Project 2. (1) Facilitate two-way communication between the public, stakeholders, managers and policy makers; (2) provide the opportunity to increase knowledge and improve understanding about natural resource management and agriculture; (3) document the role a web-based tool plays in this process; (4) ascertain the various value differences between the public, dominant stakeholder groups, and managers/decision makers that lead to conflicts over program or policy decisions; and (5) factors that facilitate the beliefs or perceptions that the decisions were adequately arrived at because the public and/or individual stakeholders directly participated in, or were adequately represented in, the systematic research used as input into the program/policy development /decision making process.

Project 3. This program will assess the current use and potential demand for energy efficient technology in the home. Since

residential real estate development is projected to a profound impact on our land and resources, it is important to assess the needs and demands of future energy use. We plan to ask residents about their understanding, and willingness to adopt energy efficient and low impact technology, such as geothermal heat, solar energy, sustainable building materials, and general energy efficiency in the home.

Project 4. This project has adapted over the years to address changing issues in waste management. Previous research efforts have examined siting problems, economics of recycling, and waste generation. Current efforts focus on waste produced through construction and demolition activities. We will present research results at professional conferences; publish and distribute experiment station publications; use popular press and other trade publications for information dissemination; and peer reviewed journal articles.

Project 5. The state wide alliance on EITC is the direct result of the findings of this study. The exhibit in Washington, DC on March 5, 2008 was a direct output of this project. The policy conference proposal was, and the conference will be, a direct output of this project. Papers and conference presentations are direct output of this project.

Project 6. Papers will be presented at regional economic association annual meetings, such as Western Regional Science Association, Southern Regional Science Association, and Northeastern Agricultural and Resource Economics Association.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
• One-on-One Intervention • Other 2 (networking meetings) • Workshop • Education Class • Other 1 (scientific meetings) • Demonstrations • Group Discussion	• Other 1 (peer reviewed publications) • Newsletters • Web sites • Public Service Announcement

3. Description of targeted audience

The target audience for the basic and applied research components of the all projects in the program include other scientists in the discipline, graduate and undergraduate students.

Project 1. Food growers and producers, distributors, marketing/retail and direct marketing enterprises; school food service directors, nutritionists, land conservation groups and planners.

Project 2. Scientists and fishermen engaged in cooperative research. General public and stakeholders impacted by water quality, air quality, and state and federal management actions. Small business owners, employees and customers associated with forestry, recreation and tourism. Teachers and environmental educators.

Project 3. Homeowners, Non-profit Sustainable Energy Associations, Legislators, contractors

Project 4. State, local, and regional waste management professionals; other researchers within discipline; general public.

Project 5. Policy and decision makers, and researchers, statewide who have interest in low-income and or rural populations.

Project 6. Fellow scientists in the discipline, firms and rural residents.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

Year	Direct Contacts Adults Target	Indirect Contacts Adults Target	Direct Contacts Youth Target	Indirect Contacts Youth Target
2009	10000	2000000	2000	10000
2010	3000	2000000	1000	3000
2011	3000	2000000	1000	3000
2012	3000	2000000	1000	3000
2013	3000	2000000	1000	3000

2. (Standard Research Target) Number of Patent Applications Submitted

Expected Patent Applications

2009 : 1   **2010** : 1   **2011** : 1   **2012** : 1   **2013** : 0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	8	0	8
2010	6	0	6
2011	6	0	6
2012	6	0	6
2013	6	0	6

V(H). State Defined Outputs

1. Output Target

- Number of participants in the project (not including audience counts, survey respondents, etc.)

  2009 : 25   **2010** : 25   **2011** : 25   **2012** : 25   **2013** : 25

- Number of undergraduate students directly involved in the projects

  2009 : 6   **2010** : 6   **2011** : 6   **2012** : 6   **2013** : 6

- Number of graduate student directly involved in the projects

  2009 : 5   **2010** : 5   **2011** : 5   **2012** : 5   **2013** : 5

- Number of university courses in which project results have been incorporated

  2009 : 5   **2010** : 5   **2011** : 5   **2012** : 5   **2013** : 5

- Number of workshops and training sessions

  2009 : 6   **2010** : 6   **2011** : 6   **2012** : 6   **2013** : 10

- Number of presentation at regional, national, or international scientific meetings

2009 :6   **2010** :6   **2011** : 6   **2012** :6   **2013** :6

- Number of book chapters written

2009 :2   **2010** :2   **2011** : 2   **2012** :2   **2013** :2

- Number of non-peer-reviewed publications (abstracts, newsletters, fact sheets, articles, etc)

2009 :15   **2010** :15   **2011** : 15   **2012** :15   **2013** :15

- Number of websites in which project results have been incorporated

2009 :5   **2010** :5   **2011** : 5   **2012** :5   **2013** :5

V(I). State Defined Outcome

O. No	Outcome Name
1	Changes in policy, programs, and stakeholder awareness related to the sustaining local food systems in a globalizing environment (qualitative output statement)
2	Increased public and stakeholder engagement in natural and agricultural resource management policies and programs (qualitative output statement)
3	Increased knowledge of the benefits and costs of natural resource policies affecting public and private lands (qualitative output statement)
4	Increased knowledge and/or changes in practices related to municipal solid waste disposal (qualitative output statement)
5	Increased knowledge of rural low-income family well-being and function in an era of welfare reform (qualitative output statement)
6	Increased knowledge of changes in rural markets, governance and quality of life (qualitative output statement)

Outcome #1

1. Outcome Target

Changes in policy, programs, and stakeholder awareness related to the sustaining local food systems in a globalizing environment (qualitative output statement)

2. Outcome Type :   Change in Condition Outcome Measure

| **2009 :**0 | **2010 :** 0 | **2011 :** 0 | **2012 :**0 | **2013 :** 0 |

3. Associated Institute Type(s)

- •1862 Research

4. Associated Knowledge Area(s)

- ● 131 - Alternative Uses of Land
- ● 403 - Waste Disposal, Recycling, and Reuse
- ● 604 - Marketing and Distribution Practices
- ● 608 - Community Resource Planning and Development
- ● 703 - Nutrition Education and Behavior
- ● 704 - Nutrition and Hunger in the Population
- ● 803 - Sociological and Technological Change Affecting Individuals, Families and Communities
- ● 903 - Communication, Education, and Information Delivery

Outcome #2

1. Outcome Target

Increased public and stakeholder engagement in natural and agricultural resource management policies and programs (qualitative output statement)

2. Outcome Type :   Change in Condition Outcome Measure

| **2009 :**0 | **2010 :** 0 | **2011 :** 0 | **2012 :**0 | **2013 :** 0 |

3. Associated Institute Type(s)

- •1862 Research

4. Associated Knowledge Area(s)

- ● 112 - Watershed Protection and Management
- ● 123 - Management and Sustainability of Forest Resources
- ● 131 - Alternative Uses of Land
- ● 134 - Outdoor Recreation
- ● 403 - Waste Disposal, Recycling, and Reuse
- ● 604 - Marketing and Distribution Practices
- ● 901 - Program and Project Design, and Statistics
- ● 903 - Communication, Education, and Information Delivery

Outcome #3

1. Outcome Target

Increased knowledge of the benefits and costs of natural resource policies affecting public and private lands (qualitative output

statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

    2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

- 1862 Research

4. Associated Knowledge Area(s)

- 131 - Alternative Uses of Land
- 402 - Engineering Systems and Equipment
- 404 - Instrumentation and Control Systems
- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development
- 903 - Communication, Education, and Information Delivery

Outcome #4

1. Outcome Target

Increased knowledge and/or changes in practices related to municipal solid waste disposal (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

    2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

- 1862 Research

4. Associated Knowledge Area(s)

- 131 - Alternative Uses of Land
- 403 - Waste Disposal, Recycling, and Reuse
- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development
- 609 - Economic Theory and Methods

Outcome #5

1. Outcome Target

Increased knowledge of rural low-income family well-being and function in an era of welfare reform (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

    2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

- 1862 Research

4. Associated Knowledge Area(s)

- 704 - Nutrition and Hunger in the Population
- 801 - Individual and Family Resource Management
- 802 - Human Development and Family Well-Being

- 803 - Sociological and Technological Change Affecting Individuals, Families and Communities
- 805 - Community Institutions, Health, and Social Services

Outcome #6

1. Outcome Target

Increased knowledge of changes in rural markets, governance and quality of life (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

- 1862 Research

4. Associated Knowledge Area(s)

- 608 - Community Resource Planning and Development
- 609 - Economic Theory and Methods
- 610 - Domestic Policy Analysis

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Competing Programatic Challenges
- Competing Public priorities
- Economy
- Public Policy changes
- Government Regulations
- Appropriations changes
- Populations changes (immigration,new cultural groupings,etc.)
- Natural Disasters (drought,weather extremes,etc.)

Description

For any field research in agriculture or natural resources, extreme and/or anomalous weather conditions or natural disasters can create new issues that require changes in planned research focus or methodology.

Change in the economy can change regional priorities and necessitate refocusing research.

The success of the research is dependent on continued NHAES funding at a sufficient level.

Changes in public policy, government regulations, competing public or NHAES might result in a rebalancing of competing programmatic investment and/or a change in program direction

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Time series (multiple points before and after program)
- Before-After (before and after program)
- During (during program)

Description

Evaluation of work will be based on peer review acceptance of manuscripts and papers, industry acceptance and application of results.

Project 1. Quantitative and qualitative assessment of impact of interventions to strengthen local food economies through

participation by farmers, food enterprises and schools and institutions. Assessment of products produced including website, newsletters and meetings for New Hampshire Center for a Food Secure Future

Project 2. This research will use comparative research that is by its very nature evaluation orientated. It will use time series data to evaluate the effectiveness and application of the web-based engagement tools. Experimental research designs will be utilized as well as triangulation through mixed method research designs. The research will compare outcomes across watersheds, states, and regions. This project will track outcomes and application of the tools and research protocols.

Project 3. Consumer survey will evaluate willingness to pay to adopt technology, such as solar hot water heaters.

Project 4. Formal and informal observation to determine how research results are being used e.g. specific changes in practice or policy. Continued analysis of data on local recycling gathered in previous years

2. Data Collection Methods

- Case Study
- Observation
- Whole population
- Sampling
- On-Site
- Unstructured
- Other (web based surveys)

Description

Feedback from target audiences (other scientists, students, regulatory agencies, planners, etc) will be collected through questions and comments at meetings, proposal and manuscript reviews, and website stakeholder input tools.

Project 1. Case studies of Farm-To-School examples are developed on an ongoing basis for education and communication; participants will be interviewed to assess progress, needs and impacts.

Project 3. Focus groups, pre-testing of a survey, mail and internet survey.

Project 4. Face to face and telephone surveys of targeted populations.

Project 5. Three waves of data were collected between 2000 and 2002 from participating rural low income families using a structured interview. Current data collection is a survey at time of tax preparation (EITC).

Project 6. After testing the results of more expensive mail surveys to a similar internet survey, internet survey techniques will be used.

V(A). Planned Program (Summary)

Program #5

1. Name of the Planned Program

Food, Nutrition & Health

2. Brief summary about Planned Program

    The NHAES Food, Nutrition and Health research program has nine projects: two related to food safety and biosecurity, two related to human health, and two related to nutrition and three related to obesity. Project 1 This project will evaluate the effectiveness & relative safety of biosolids, Class A, for reovirus contamination that are intended for land application. Project 2 is a study of the regulation of Escherichia coli Shiga-like toxins and their impact on host cell apoptosis. Project 3 is examining the effects of hyperglycemia and dyslipidemia on the expression of adhesion molecules by arterial endothelial cells. Project 4 is a laboratory study of nucleotide metabolism during signal transduction in retinal photoreceptor cells. Project 5 is examining the regulation of zinc transport by endothelial cells. Project 6 is a program to improve fruit, vegetable and whole grain) availability and intake in older adults. Project 7 will focus on identifying metabolic links that would explain the relationship of obesity and development of allergic disease and the factors that may contribute to this relationship. Project 8 is uncovering links between environmental pollutants and obesity. Project 9 is studying the regulation of gene expression in adipogenic cells by insulin, glucocorticoids and phosphodiesterase inhibitors.

3. Program existence :   Mature (More then five years)

4. Program duration :   Long-Term (More than five years)

5. Expending formula funds or state-matching funds :   Yes

6. Expending other than formula funds or state-matching funds :   Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation			6%	
135	Aquatic and Terrestrial Wildlife			3%	
302	Nutrient Utilization in Animals			4%	
304	Animal Genome			4%	
305	Animal Physiological Processes			23%	
311	Animal Diseases			3%	
403	Waste Disposal, Recycling, and Reuse			1%	
502	New and Improved Food Products			1%	
607	Consumer Economics			1%	
701	Nutrient Composition of Food			6%	
702	Requirements and Function of Nutrients and Other Food Component			11%	
703	Nutrition Education and Behavior			16%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Pa			12%	
722	Zoonotic Diseases and Parasites Affecting Humans			4%	
723	Hazards to Human Health and Safety			3%	

724	Healthy Lifestyle			2%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Project 1. The safety of of biosolids application to agricultural land needs further research for risk assessment and public acceptance gain confidence. The priority of this research project is to assess viral contamination.

Project 2. Pathogen E. coli causes bloody diarrhea or hemorrhagic colitis (HC) in infected individuals. The outcomes of infection are most severe in children. Indeed, hemolytic uremic syndrome (HUS) caused by this pathogen is now the commonest cause of kidney failure in children and has a high fatality rate. However, in addition to the direct detrimental impact on human health, the presence of this pathogen in foods leads to massive recalls of contaminated foodstuffs. These recalls can sometimes be in the range of millions of pounds of recalled ground beef. Furthermore, foodborne outbreaks of disease have a major negative impact on the population's acceptance of these foods (whole markets collapse for food associated with outbreaks caused by this pathogen). Finally, the economic loss can be catastrophic in that many companies have been driven into bankruptcy by outbreaks associated with ground beef, spinach or other food products.

Project 3. Atherosclerosis is a primary factor leading to cardiovascular disease, which is a leading cause of death in the U.S. There is emerging that diabetes is a significant risk factor for developing atherosclerosis. Knowing how diabetes accelerates cardiovascular disease can lead to methods of prevention and treatment.

Project 4. Some diseases of the retinal in animals and humans result from defects in the enzymes controlling the initial events of vision. In some cases, these defects preferentially target cone photoreceptor cells, resulting in a loss of visual acuity or color discrimination. The project will provide a better understanding of how cone photoreceptors differ from rod photoreceptors, leading to better treatments for retinal diseases that target photoreceptor cells.

Project 5. Zinc imbalance in the brain is suspected as a contributor to neurological disorders. This may result when healthy physiological processes that regulate the amount of zinc entering the brain malfunction or are unable to accommodate extremes of zinc malnutrition. We do not currently know how these regulatory processes work in the brain.

Project 6. Despite the USDA recommendations and guidelines, older adults do not consume adequate intake of fruit vegetable and whole grains. The typical American consumes about one serving of whole grain food each day. The USDA's MyPyramid information recommends that consumers aim for at least 3 servings of whole grain foods or half of all grain servings each day. More information is needed about how older adults identify and select whole grain food products and the barriers they encounter to meet MyPyramid recommendations.

Project 7. Incidence of asthma in New Hampshire is 14%, a percentage that is highest in the New England area and above the National average. There is increasing evidence for a connection between obesity, diabeties, insulin resistance and asthma.

Project 8. : PBDEs are ubiquitous & persistant in our environment. They may disrupt hormone signals once inside the body. This project will estimate the body burden of PBDEs and explore potential health implications of this burden in contributing to obesity.

Project 9. Obesity is a growing health concern in the United States as the number of individuals considered to be overweight or obese has increased to alarming levels. Since abnormal adiposity is also associated with the development of pathological conditions such as cardiovascular disease and Diabetes, it is of importance to elucidate mechanisms underlying adipose tissue misfunction under these physiological states.

2. Scope of the Program

- Multistate Integrated Research and Extension
- Multistate Research
- Integrated Research and Extension
- In-State Research
- In-State Extension
- Multistate Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Project 1.

-

Reoviruses are present in biosolid wastes

-

Will add to the data base on virus occurrence in class A biosolids.

Project 2.

-

The incidence of severe disease especially in children infected from agricultural food products is rising.

-

The present work will profoundly affect this severe condition and its health-related outcomes as well as ameliorate the detrimental impact it has on the economics of food production and the acceptability of foods to the general public.

Project 3.

-

The effects of abnormally high blood glucose levels on arterial health will be determined.

-

The ways in which diabetes accelerates atherosclerosis will be better defined

Project 4

-

The operating hypothesis is that visual transduction in cone photoreceptors will differ in discrete ways that can be quantified by examining the central enzyme of the pathway, phosphodiesterase.

Project 5

-

The pig's brain metabolizes zinc similar to the human brain.

-

The pig's brain cells grown in our laboratory respond similarly to how they would respond in the head.

Project 6

-

Phytonutrients in fruit vegetables and whole grains will improve health outcomes when consumed in adequate amount.

-

The number and percent of older adults is increasing rapidly in the US.

-

Whole grain food consumption is less than recommended levels.

-

Little is known about how older adults identify whole grain foods and barriers to consumption.

Project 7.

-

Findings of proposed work will help delineate the mechanism by which obesity may contribute to pulmonary disease.

Project 8.

-

There is a link between environmental pollutants, such as PBDEs and obesity.

Project 9.

-

Jagged1 is a regulator of adipogenesis. Its expression during fat cell development is tightly controlled and abnormal expression interferes with adipocyte differentiation and function. We expect that the expression of Jagged1 will be found to be transcriptionally regulated by glucocorticoids but not insulin.

2. Ultimate goal(s) of this Program

The ultimate goal of the program is to improve the health and nutrition and ensure food safety of the citizens of New Hampshire and the region. Goals of the individual projects are as follows:

Project 1. To assure the safety and to help with the public acceptance of the land application of class A biosolids thru research.

Project 2. The goal of our molecular genetics approach along with protein chemistry and cell biology studies is to ensure greater and safer acceptance of food products.

Project 3: To help develop drugs or lifestyle changes that can inhibit the adverse effects of elevated blood glucose levels on the cardiovascular system.

Project 4. The ultimate goal is to define the biochemical pathway responsible for cone vision, so that defects in vision in animals and humans that result from impaired functioning of cone photoreceptors can be therapeutically treated.

Project 5. To develop treatments for persons who are at risk of Alzheimer's Disease because their ability to regulate zinc in the brain is compromised.

Project 6. To develop effective intervention strategies to increase intake of fruit vegetables and whole grains
Once more is known about how older adults identify and select whole grain foods, educational programs can be developed to increase consumption.

Project 7. Identify the mechanism and process by which weight gain in humans promotes pulmonary disease, such as allergic asthma.

Project 8. To determine the link between PBDEs and obesity.

Project 9. To determine the molecular mechanisms regulating Jagged1 transcription during adipogenesis.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2009	0.0	0.0	3.4	0.0
2010	0.0	0.0	3.4	0.0
2011	0.0	0.0	3.4	0.0
2012	0.0	0.0	3.4	0.0
2013	0.0	0.0	3.4	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Project 1. In laboratory studies using of integrated cell culture and real time PCR, detection of Reovirus will be compared in 1) alkaline stabilized and 2) anaerobically digested, class A biosolids. Results will be presented at scientific meetings and published in peer reviewed journals.

Project 2. Plan to use laboratory research to develop mechanisms to prevent Escherichia coli O157:H7 infections leading to hemolytic uremic syndrome (HUS) especially in children. Our strategies are to interrupt this cycle and lead to improved human

health and better acceptance of food products. We will publish our findings in peer reviewed journals as well as at national, international and regional meetings and workshops.

Project 3. Will carry out laboratory (in vitro) studies to determine the effects of hyperglycemic and dyslipidemic conditions on the expression of cellular adhesion molecules and inflammatory proteins in aortic endothelial cells. Results will be presented at scientific meetings and published in peer reviewed journals.

Project 4. Will complete laboratory studies to examine the molecular basis of visual signaling and to determine how the biochemical pathways that regulate rod photoreceptor vision (night vision) differ from those that control the light response in cone photoreceptors (daytime and color vision). Our research emphasizes analysis of the structural and functional differences in key enzymes in the signaling pathway. Ultimately, understanding the molecular details of rod and cone visual signaling will permit new treatments to preserve vision and prevent retinal degeneration and blindness in humans and animals. Results will be presented at scientific meetings and published in peer reviewed journals. Creation of web-based information.

Project 5. We will expose our laboratory model of the blood-brain barrier to conditions that are deficient or excessive in zinc while monitoring the transport of zinc across this barrier. We will measure the relative abundance and location of specific zinc transport proteins and relate this to changes in transport kinetics to describe its regulation. Results will be presented at scientific meetings and published in peer reviewed journals.

Project 6. A research protocol will be developed and pre-tested. Older adults will be recruited to participate in the research interviews. Research interviews will be conducted by each of the participating stations. Results will be analyzed by the research group. Workshops, lectures, newletters. Peer reviewed publications.

Project 7. The project will use laboratory analyses and animal studies to examine the effect of insulin resistance on Th1/Th2 cytokines, TNF-alpha and pulmonary function in miniature swine. Findings will be reported in research publications, professional meetings and meetings with general public.

Project 8. Laboratory experiments using rats will be conducted to determine whether PBDE exposure exacerbates the subsequent obesity promoting influence of high calorie diets.

Project 9. Will carry out laboratory experiments to determine the sensitivity of Jagged1 transcription under conditions that promote adipogenic cell differentiation. Jagged1 mRNA levels and transcription rates will be measured in cells exposed to adipogenic hormones using quantitative real time PCR and nuclear run-on assays. Once the expression pattern is known, we will identify the transcriptional regulators that govern its expression using luciferase reporter assays and chromosomal immunoprecipitation. Functional significance of factor binding will be assessed through mutational analysis of the Jagged1 promoter.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
- Other 2 (One on one discussions) - One-on-One Intervention - Education Class - Other 1 (Laboratory research) - Group Discussion - Demonstrations - Workshop	- Public Service Announcement - Other 1 (Peer reviewed publications) - Web sites - Newsletters

3. Description of targeted audience

The target audience for the basic and applied research components of the all projects in the program include other scientists in the discipline, graduate and undergraduate students.

Project 1. Farmers, consumes, health agencies, regulators, municipalities.

Project 2. Medical personnel, farm organizers, abbatoir systems, food processing companies, consumers, health agencies, restaurants.

Project 3. Medical community, heart association, public.

Project 4. Academic researchers in vision and ophthalmology, pharmaceutical companies with drug discovery programs

Project 5. Scientists, nutritionists, teachers, and clinicians.

Project 6. Adults 65 years of age or older who shop for and prepare at least one meal a day.

Project 9. All scientists in the areas of adipose tissue biology, Jagged1/Notch signaling, Insulin and glucocorticoid signaling. Also- Middle School students particpating in outreach on adiopocyte biology.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2009	1700	7900	70	0
2010	600	4300	120	0
2011	350	3800	120	0
2012	150	1300	20	0
2013	150	1300	20	0

2. (Standard Research Target) Number of Patent Applications Submitted

Expected Patent Applications

2009 : 2   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	9	0	9
2010	6	0	6
2011	8	0	8
2012	6	0	6
2013	5	0	5

V(H). State Defined Outputs

1. Output Target

- Number of participants in the project (not including audience counts, subjects or survey respondents)

2009 : 18   **2010 :** 18   **2011 :** 18   **2012 :** 18   **2013 :** 18

- Number of undergraduate students directly involved in the projects

  2009 :6   **2010** :6   **2011** : 6   **2012** :6   **2013** :6

- Number of graduate student directly involved in the projects

  2009 :6   **2010** :6   **2011** : 6   **2012** :6   **2013** :6

- Number of university courses in which project results have been incorporated

  2009 :8   **2010** :8   **2011** : 8   **2012** :8   **2013** :8

- Number of workshops and training sessions

  2009 :4   **2010** :4   **2011** : 4   **2012** :4   **2013** :4

- Number of presentation at regional, national, or international scientific meetings

  2009 :9   **2010** :9   **2011** : 9   **2012** :9   **2013** :9

- Number of book chapters written

  2009 :0   **2010** :0   **2011** : 0   **2012** :0   **2013** :0

- Number of non-peer-reviewed publications (abstracts, newsletters, fact sheets, articles, etc)

  2009 :15   **2010** :10   **2011** : 10   **2012** :8   **2013** :8

- Number of websites in which project results have been incorporated

  2009 :5   **2010** :5   **2011** : 5   **2012** :5   **2013** :5

V(I). State Defined Outcome

O. No	Outcome Name
1	Increased knowledge about methods for detecting reovirus in Class A biosolids (qualitative output statement)
2	Increased knowledge about regulation of Escherichia coli Shiga-like toxins and their impact on host cell apoptosis (qualitative output statement)
3	Increased knowledge about effects of hyperglycemia and dyslipidemia on the expression of adhesion molecules by arterial endothelial cells (qualitative output statement)
4	Increased knowledge about nucleotide metabolism during signal transduction in retinal photoreceptor cells (qualitative output statement)
5	Increased knowledge about regulation of zinc transport by endothelial cells (qualitative output statement)
6	Increased knowledge about fruit, vegetable and whole grain) availability and intake in older adults (qualitative output statement)
7	Increased knowledge about metabolic links that would explain the relationship of obesity and development of allergic disease (qualitative output statement)
8	Increased knowledge about links between environmental pollutants and obesity (qualitative output statement)
9	Increased knowledge about regulation of gene expression in adipogenic cells by insulin, glucocorticoids and phosphodiesterase inhibitors (qualitative output statement)

Outcome #1

1. Outcome Target

Increased knowledge about methods for detecting reovirus in Class A biosolids (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

   2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

   •1862 Research

4. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation

- 403 - Waste Disposal, Recycling, and Reuse

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

Outcome #2

1. Outcome Target

Increased knowledge about regulation of Escherichia coli Shiga-like toxins and their impact on host cell apoptosis (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

   2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

   •1862 Research

4. Associated Knowledge Area(s)

- 311 - Animal Diseases

- 607 - Consumer Economics

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

- 722 - Zoonotic Diseases and Parasites Affecting Humans

Outcome #3

1. Outcome Target

Increased knowledge about effects of hyperglycemia and dyslipidemia on the expression of adhesion molecules by arterial endothelial cells (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

   2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

   •1862 Research

4. Associated Knowledge Area(s)

- 305 - Animal Physiological Processes

- 311 - Animal Diseases

- 702 - Requirements and Function of Nutrients and Other Food Components

- 703 - Nutrition Education and Behavior

Outcome #4

1. Outcome Target

Increased knowledge about nucleotide metabolism during signal transduction in retinal photoreceptor cells (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 135 - Aquatic and Terrestrial Wildlife

● 305 - Animal Physiological Processes

● 723 - Hazards to Human Health and Safety

Outcome #5

1. Outcome Target

Increased knowledge about regulation of zinc transport by endothelial cells (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 304 - Animal Genome

● 305 - Animal Physiological Processes

● 702 - Requirements and Function of Nutrients and Other Food Components

Outcome #6

1. Outcome Target

Increased knowledge about fruit, vegetable and whole grain) availability and intake in older adults (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 502 - New and Improved Food Products

● 701 - Nutrient Composition of Food

● 702 - Requirements and Function of Nutrients and Other Food Components

● 703 - Nutrition Education and Behavior

● 724 - Healthy Lifestyle

Outcome #7

1. Outcome Target

Increased knowledge about metabolic links that would explain the relationship of obesity and development of allergic disease (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 311 - Animal Diseases

● 703 - Nutrition Education and Behavior

Outcome #8

1. Outcome Target

Increased knowledge about links between environmental pollutants and obesity (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 302 - Nutrient Utilization in Animals

● 305 - Animal Physiological Processes

● 311 - Animal Diseases

● 701 - Nutrient Composition of Food

● 703 - Nutrition Education and Behavior

● 723 - Hazards to Human Health and Safety

Outcome #9

1. Outcome Target

Increased knowledge about regulation of gene expression in adipogenic cells by insulin, glucocorticoids and phosphodiesterase inhibitors (qualitative output statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 302 - Nutrient Utilization in Animals

● 305 - Animal Physiological Processes

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Populations changes (immigration,new cultural groupings,etc.)
- Appropriations changes
- Government Regulations
- Competing Programatic Challenges
- Economy
- Natural Disasters (drought,weather extremes,etc.)
- Competing Public priorities
- Public Policy changes

Description

For any field research in agriculture or natural resources, extreme and/or anomalous weather conditions or natural disasters can create new issues that require changes in planned research focus or methodology.

Change in the economy can change regional priorities and necessitate refocusing research.

The success of the research is dependent on continued NHAES funding at a sufficient level.

Changes in public policy, government regulations, competing public or NHAES might result in a rebalancing of competing programmatic investment and/or a change in program direction

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)
- Before-After (before and after program)
- Time series (multiple points before and after program)

Description

Evaluation of work will be based on peer review acceptance of manuscripts and papers, industry acceptance and application of results. . During each project, data are analyzed and research is evaluated.

2. Data Collection Methods

- Mail
- Case Study
- On-Site
- Unstructured
- Observation
- Other (Lab and Field Research)
- Sampling
- Tests

Description

Feedback from target audiences (other scientists, students, regulatory agencies, planners, etc) will be collected through questions and comments at meetings, proposal and manuscript reviews, and website stakeholder input tools.

V(A). Planned Program (Summary)

Program #6

1. Name of the Planned Program

Natural Resources & Environment

2. Brief summary about Planned Program

The NHAES will have 11 projects in the Natural Resources and Ecosystem Program. Project 1is a multidisciplinary, multi-investigator study of ecosystem services in a fragmenting forested landscape. Project 2 and 3 are related field, literature, and herbarium research studies linking the effects of historic and contemporary land uses to exotic shrub invasions. Project 4 is a US-Canadian case study of human community adaptation to forested ecosystem migration as a result of climate change. Project 5 is a field and mesocosm study to help guide integrated upland and wetland habitat management for vernal pool-dependent amphibians. Project 6 is a filed investigation of the effects of forest management on stream insects in White Mountain National Forest. Project 7 is a field and laboratory study of microcystins in New Hampshire lakes that will consider localized impacts of blooms and implications for human health. Project 8 will catalog marine invertebrates using molecular barcodes. Project 9. Is a field and herbarium study seaweed biodiversity and introduced seaweeds within the Gulf of Maine. Project 10 Is a field, herbarium and laboratory study to tracking the dispersal of invasive marine algal species with molecular markers. Project 11 is the curation of the UNH Herbarium: barcoding, databasing, digitizing and web development.

3. Program existence :   Mature (More then five years)

4. Program duration :   Long-Term (More than five years)

5. Expending formula funds or state-matching funds :   Yes

6. Expending other than formula funds or state-matching funds :   Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			5%	
112	Watershed Protection and Management			2%	
123	Management and Sustainability of Forest Resources			16%	
131	Alternative Uses of Land			2%	
132	Weather and Climate			3%	
133	Pollution Prevention and Mitigation			2%	
134	Outdoor Recreation			3%	
135	Aquatic and Terrestrial Wildlife			18%	
136	Conservation of Biological Diversity			28%	
202	Plant Genetic Resources			3%	
206	Basic Plant Biology			2%	
213	Weeds Affecting Plants			5%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and (			5%	
605	Natural Resource and Environmental Economics			2%	
723	Hazards to Human Health and Safety			1%	

903	Communication, Education, and Information Delivery			3%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Project 1 Southeastern NH is undergoing rapid land use change due to its rapidly increasing human population density, and forest parcels are becoming smaller and more fragmented. A priority of this project is to examine the impacts of these three aspects of development – land use change, parcelization, and forest fragmentation. Characterizing human impacts on ecosystem services encompasses several of the Grand Challenges in Environmental Sciences (NRC 2001).

Project 2 & 3 Invasive, non-native shrubs have been shown to reduce regeneration of economically important forest trees. They also harbor higher populations of black-legged ticks (carriers of Lyme disease) than other types of forest understory. Such shrubs are increasing in abundance in natural and managed forests throughout the region.

Project 4 The 2007 Intergovernmental Panel on Climate Change reports that ecosystems in the US-Canadian Rocky Mountains will be impacted by a diverse set of influences that include changes in fire frequency and intensity, movement of species, migration pattern disruption, reduced surface water, shifts in stream flow, and habitat loss. The human components of ecosystem are also impacted.

Project 5 In order to manage lands effectively we need a solid understanding of habitat requirements of species we are managing. We lack this information for amphibians for upland habitat requirements.

Project 6. While insects are often used as tools for indicating change, the between-year variation in biodiversity and abundance is unexplored. To understand changes due to management or climatic change, the baseline between-year variation must be documented.

Project 7. Blue green bacteria blooms and their associated toxic releases are already impacting NH by causing beach closures and surface water supply concerns. Research is needed to better understand why these blooms are occurring more often, what triggers them and what management practices can be employed to predict, prevent and /or mange for these occurrences.

Project 8. Invertebrate biodiversity is not well known for the Gulf of Maine. This information is important as it will aid in the future recognition of alien or invasive species by detecting shifts in invertebrate communities.

Project 9 Preservation of biodiversity of marine communities is a priority. This project will evaluate the species of seaweeds within different habitats in the Gulf of Maine, including rather pristine and stressed environments. In addition sites of high incidence of introduced seaweeds will be identified in order to characterize the sources and vectors of these introductions.

Project 10. Introduced marine algae have become serious threats to coastal habitats in the Gulf of Maine. They are threatening juvenial fish habitats, disrupting shellfish beds, and foul beaches. The red algae Neosiphonia harveyi was introduced from Japan to the Gulf of Maine over 100 years ago. The green macro alga Codium fragile ssp. tomentosoides reached the Gulf of Maine in the 1960's and now appears to function as a vector spreading Neosiphonia harveyi.

Project 11. Herbaria are an important part of the research infrastructure and provide a valuable resources for studies of ecology, biodiversity , invasive species, taxonomy and systematic. The internet has cause a revolution in the curation of natural history collections. Herbaria worldwide are databasing and scanning their collections so that they can be accessed through global internet biodiversity portals. The UNH herbarium has more than 200,000 specimens.

2. Scope of the Program

- Multistate Research
- In-State Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

  Project 1

- Fragmentation is assumed to affect ecosystem services as it affects the species assemblages of plants, animals, and microbes.
  Projects 2&3

- Identity of areas vulnerable to invasive shrubs will be based on few factors.

- Interest in, concern about, and commitment to control of invasive plants will increase over time.
  Non-native shrubs can be controlled.
  Project 4

- A case study of the human community adaptation to ecosystem change in the Rocky Mountains will be relevant to the Northeast.
  Project 5

- Increasing knowledge about upland habitat requirements will enhance our ability to manage lands more effectively for amphibians.
  Project 6

- Biodiversity and abundances will vary insignificantly between-years, and allow establishment of a stable set of diversity/abundance values that will be typical of White Mountain National Forest streams.
  Project 7

- Demand on lakes by recreation and drinking water continues to increase.

- Funding and graduate student interest will continue

- Water supply managers will continue to be interested in this phenomenon.

- Bloom dynamics can be defined by water conditions
  Project 8

- Sequence variations within species will be less than 2% so that species boundaries can be identified

- At least 5 specimens of each species will be found

- Universal CO-I primers will amplify products from all specimens;

- if not, universal 28S rDNA primers will amplify products from all specimens
  Project 9

- Introduced/invasive species can be better contained or the impacts minimized based upon enhanced knowledge of their vectors and means of introductions.
  Project 10

- It is unlikely that these invasive algae will be contained, but better understanding of the interactions of invasive species may provide information to contain or control introduction of additional species in the future.
  Project 11

- Creation of a virtual herbarium on the internet will increase the availability and augment the value of the UNH collections

2. Ultimate goal(s) of this Program

  Overall, the ultimate goal of the program is to enhance our knowledge of natural resource, biodiversity and ecosystems to support the development of more effective conservation and management strategies. Individual project goals are as follows:

Project 1. Although our initial efforts will produce valuable short-term products, our research initiative will also include development of a long-term research infrastructure that will document the trajectory of change in our study region and provide insights into the tradeoffs in ecosystem services that accompany various development strategies.

Project 2&3. The develop management protocols that limit spread of invasive shrubs and to promote silvicultural methods that minimize the invasion of non-native shrubs and thus their impact on forest productivity and biological diversity.

Project 4. To develop a management strategy for human community adaptation to climate change

Project 5. To manage lands more effectively for amphibians.

Project 6. To document stream diversity and abundances for typical national forest streams that will identify a core groups of species that will serve as a baseline for measuring the effects of forest disturbance events, either through forest management or climate change.

Project 7. To predict the occurrence of blue green bacteria blooms to assist lake and water supply managers. To trace the movement of microcystin toxin through the food web to better understand the long-term impacts of these blooms on recreational and charismatic species. To reduce and prevent the occurrence of blue green bacteria blooms through informed watershed management.

Project 8. To assess invertebrate biodiversity of the Gulf of Maine. To provide a web page of biodiversity information of marine invertebrates including genetic, species, and habitat data.

Project 9. To help maintain high diversity of critically important seaweed populations and reduce the occurrence of invasive/harmful taxa.

Project 10. To determine the population structure of introduced algal species, to determine whether their invasive behavior results of adaptation to the new environment or from repeated introductions of more aggressive genotypes of the marine macroalgae.

Project 11. To provide increased accessibility to the herbarium in support of a wide range of research

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2009	0.0	0.0	5.8	0.0
2010	0.0	0.0	5.8	0.0
2011	0.0	0.0	5.8	0.0
2012	0.0	0.0	5.8	0.0
2013	0.0	0.0	5.8	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Project 1 will conduct field, laboratory and literature research to document historic and ongoing patterns of population density, land use, land cover, and forest fragmentation in the watershed. Standing stocks of C and N in soils, dead wood (coarse woody debris), and tree biomass in plots with different land uses will be documented along with ongoing changes due to forest fragmentation. Results will be disseminated in peer-reviewed publication and at scientific meetings.

Project 2&3 will examine the relationship between the density and age structure of invasive shrubs and cutting practices including group selection and clearcutting. The projects will use dendrochronological methods to reconstruct shrub invasion in each stand. Results will be presented at regional and national conferences and workshops, especially those attended by land managers.

Project 4 will a develop a case study using data derived from a variety of sources including literature, interviews, GIS, maps, meeting minutes and others. Results will be presented at regional, national and international meetings and published in a peer reviewed journal

Project 5 will establish field enclosures in different upland habitat types in which to put metamorphic amphibians to examine growth and survival. The results will be written up for submission to a peer reviewed journal.

Project 6 will conduct annual field surveys to document the variation in biodiversity and abundances of stream insects between-years, and will establish of a stable set of diversity/abundance values that will be typical of White Mountain National Forest streams. Reports will be generated for the stakeholder groups, presentations at meetings for the regional and national stakeholder groups, and papers published on selected foci of the program.

Project 7 will use field and laboratory methods to research spatial distribution of both blue green bacteria and resulting microcystin toxin and to examine water, wildlife and sediment components for toxins.
Results will be disseminated through publications and presentations at scientific meetings. A statewide biotoxin monitoring program and workshops on monitoring procedures will be developed.

Project 8 will make field collection of marine invertebrates in the Gulf of Maine and use molecular laboratory methods to sequence "barcode" genes. The project will development of an open access web page with information on marine invertebrates of the Gulf of Maine; genetic, habitat and species data.

Project 9 will make field collections of native and introduced seaweeds in diverse Gulf of Maine habitats in order to assess historical and recent patterns of diversity and introduced taxa. Specimens will be deposited in the UNH Herbarium.

Project 10 will collect field population samples of invasive seaweeds in the Gulf of Maine and will use laboratory analyses to document genetic structure. Specimen will be preserved in the UNH Herbarium. Findings will be reported in the scientific literature. Information will be conveyed to the public through pamphlets, and an informational website.

Project 11 will make high resolution scans and database label information including collector, collection location, date, etc, species name, and all other information on the specimen. The database will be made available over the internet via a UNH herbarium website and through global biodiversity portals.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
• Education Class • Workshop • Group Discussion • Other 2 (Laboratory research) • Demonstrations • Other 1 (Field Research) • One-on-One Intervention	• Web sites • Public Service Announcement • Newsletters • Other 1 (Peer reviewed publications)

3. Description of targeted audience

The target audience for the basic and applied research components of the all projects in the program include other scientists in the discipline, graduate and undergraduate students.

Projects 1, 2, 3, 4 & 5 Forest ecologists and managers, forest land owners, foresters, loggers, conservation groups, land

protection groups,(land trusts, etc.), ecologists, silviculturalists, resource and community planners, state and federal agency personnel

Project 6. State, contract, local, regional, and national individuals or groups that utilize aquatic insects as indicators of water quality, and those interested in the effects of disturbance upon these group.

Project 7. State agencies, lakes Associations, Lakes Congress, water suppliers, Interested public

Project 8, 9 & 10. Ecologists, conservation biologists, resource managers, aquaculture farmers, fisheries biologists, and biosecurity officers (eg, customs officials, specialists for invasive species control).

Project 9 & 10. Plant biologist, ecologists, taxonomists and systematists, students, conservation and resource management agencies.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2009	900	1500	50	80
2010	900	1500	50	80
2011	900	1500	50	80
2012	900	1500	50	80
2013	900	1500	50	80

2. (Standard Research Target) Number of Patent Applications Submitted

Expected Patent Applications

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	12	0	12
2010	12	0	12
2011	12	0	12
2012	12	0	12
2013	12	0	12

V(H). State Defined Outputs

1. Output Target

- Number of participants directly involved in the project (not including audience counts, workshop participants, survey respondents, etc)

  2009 : 45   **2010 :** 45   **2011 :** 25   **2012 :** 25   **2013 :** 25

- Number of undergraduate students directly involved in the projects

  2009 : 15   **2010** : 15   **2011** : 10   **2012** : 10   **2013** : 10

- Number of graduate student directly involved in the projects

  2009 : 15   **2010** : 15   **2011** : 10   **2012** : 10   **2013** : 10

- Number of university courses in which project results have been incorporated

  2009 : 15   **2010** : 15   **2011** : 10   **2012** : 10   **2013** : 10

- Number of workshops and training sessions

  2009 : 3   **2010** : 3   **2011** : 3   **2012** : 3   **2013** : 3

- Number of presentation at regional, national, or international scientific meetings

  2009 : 15   **2010** : 15   **2011** : 10   **2012** : 10   **2013** : 10

- Number of book chapters written

  2009 : 1   **2010** : 0   **2011** : 0   **2012** : 0   **2013** : 0

- Number of non-peer-reviewed publications (abstracts, newsletters, fact sheets, articles, etc)

  2009 : 18   **2010** : 18   **2011** : 12   **2012** : 12   **2013** : 12

- Number of websites in which project results have been incorporated

  2009 : 12   **2010** : 12   **2011** : 12   **2012** : 12   **2013** : 12

V(I). State Defined Outcome

O. No	Outcome Name
1	Increased knowledge about ecosystem services in a fragmenting forested landscape (quantitative outcome statement)
2	Increased knowledge about the effects of historic and contemporary land uses to exotic shrub invasions (quantitative outcome statement)
3	Increased knowledge about human community adaptation to forested ecosystem migration as a result of climate change (quantitative outcome statement)
4	Increased knowledge about guide integrated upland and wetland habitat management for vernal pool-dependent amphibians (quantitative outcome statement)
5	Increased knowledge about effects of forest management on stream insect biodiversity (quantitative outcome statement)
6	Increased knowledge about microcystins in New Hampshire lakes, the localized impacts of blooms and implications for human health (quantitative outcome statement)
7	Increased knowledge about the biodiversity of invertebrates in the Gulf of Maine (quantitative outcome statement)
8	Increased knowledge about seaweed biodiversity and introduced seaweeds within the Gulf of Maine (quantitative outcome statement)
9	Increased knowledge about the population genetics and dispersal of invasive seaweeds in the Gulf of Maine (quantitative outcome statement)
10	Progress in scanning, databasing, and curating the UNH Herbarium (quantitative and/or outcome statement)

<u>Outcome #1</u>

1. Outcome Target

Increased knowledge about ecosystem services in a fragmenting forested landscape (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

    2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

  •1862 Research

4. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships

- 112 - Watershed Protection and Management

- 135 - Aquatic and Terrestrial Wildlife

<u>Outcome #2</u>

1. Outcome Target

Increased knowledge about the effects of historic and contemporary land uses to exotic shrub invasions (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

    2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

  •1862 Research

4. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources

- 135 - Aquatic and Terrestrial Wildlife

- 136 - Conservation of Biological Diversity

<u>Outcome #3</u>

1. Outcome Target

Increased knowledge about human community adaptation to forested ecosystem migration as a result of climate change (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

    2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

  •1862 Research

4. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources

- 131 - Alternative Uses of Land

- 132 - Weather and Climate

- 134 - Outdoor Recreation

- 605 - Natural Resource and Environmental Economics

Outcome #4

1. Outcome Target

Increased knowledge about guide integrated upland and wetland habitat management for vernal pool-dependent amphibians (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources

- 135 - Aquatic and Terrestrial Wildlife

- 136 - Conservation of Biological Diversity

Outcome #5

1. Outcome Target

Increased knowledge about effects of forest management on stream insect biodiversity (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 112 - Watershed Protection and Management

- 123 - Management and Sustainability of Forest Resources

- 135 - Aquatic and Terrestrial Wildlife

- 136 - Conservation of Biological Diversity

Outcome #6

1. Outcome Target

Increased knowledge about microcystins in New Hampshire lakes, the localized impacts of blooms and implications for human health (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 112 - Watershed Protection and Management

- 133 - Pollution Prevention and Mitigation

- 135 - Aquatic and Terrestrial Wildlife

- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals

● 723 - Hazards to Human Health and Safety

Outcome #7

1. Outcome Target

Increased knowledge about the biodiversity of invertebrates in the Gulf of Maine (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0	**2010 :** 0	**2011 :** 0	**2012 :** 0	**2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 135 - Aquatic and Terrestrial Wildlife

● 136 - Conservation of Biological Diversity

Outcome #8

1. Outcome Target

Increased knowledge about seaweed biodiversity and introduced seaweeds within the Gulf of Maine (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0	**2010 :** 0	**2011 :** 0	**2012 :** 0	**2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 132 - Weather and Climate

● 133 - Pollution Prevention and Mitigation

● 135 - Aquatic and Terrestrial Wildlife

● 136 - Conservation of Biological Diversity

● 206 - Basic Plant Biology

● 213 - Weeds Affecting Plants

Outcome #9

1. Outcome Target

Increased knowledge about the population genetics and dispersal of invasive seaweeds in the Gulf of Maine (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0	**2010 :** 0	**2011 :** 0	**2012 :** 0	**2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 134 - Outdoor Recreation

● 136 - Conservation of Biological Diversity

● 213 - Weeds Affecting Plants

Outcome #10

1. Outcome Target

Progress in scanning, databasing, and curating the UNH Herbarium (quantitative and/or outcome statement)

2. Outcome Type :   Change in Condition Outcome Measure

2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 136 - Conservation of Biological Diversity

● 202 - Plant Genetic Resources

● 903 - Communication, Education, and Information Delivery

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

● Appropriations changes
● Public Policy changes
● Natural Disasters (drought,weather extremes,etc.)
● Populations changes (immigration,new cultural groupings,etc.)
● Economy
● Competing Programatic Challenges
● Government Regulations
● Competing Public priorities

Description

     For any field research in agriculture, extreme and/or anomalous weather conditions or natural disasters can produce atypical results that require changes in planned research methodology.

     Change in the economy can change regional priorities and necessitate refocusing research.

     The success of the research is dependent on continued NHAES funding at a sufficient level.

     Changes in public policy, government regulations, competing public or NHAES might result in a rebalancing of competing programmatic investment and/or a change in program direction

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

● Time series (multiple points before and after program)
● During (during program)
● After Only (post program)
● Retrospective (post program)
● Before-After (before and after program)
● Case Study

Description

     Evaluation of work will be based on peer review acceptance of manuscripts and papers, industry acceptance and application

of results. During each project, data are analyzed and research is evaluated.

2. Data Collection Methods

- On-Site
- Sampling
- Other (Reviews)
- Case Study
- Unstructured
- Observation
- Journals

Description

Feedback from target audiences (other scientists, students, regulatory agencies, planners, etc) will be collected through questions and comments at meetings, proposal and manuscript reviews, and website stakeholder input tools.

V(A). Planned Program (Summary)

Program #7

1. Name of the Planned Program

Pest Management

2. Brief summary about Planned Program

Although we currently have only a single active project in pest management, it is an area that we plan to grow as part of our Horticulture program. Future projects will be listed there. Consequently, the five year plan of work shows the phasing out of Pest Management as a separate program with decreasing output and outcome targets.

Project 1: This project seeks to understand how hormones control reproductive physiology and behavior of beetles that are opportunistic breeders. Multiple species are used as a model system this group displays a variety of life histories.

3. Program existence :   Mature (More then five years)

4. Program duration :   Short-Term (One year or less)

5. Expending formula funds or state-matching funds :   Yes

6. Expending other than formula funds or state-matching funds :   Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
215	Biological Control of Pests Affecting Plants			100%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Little is known about the hormonal control of reproduction by beetles, many of which are pests. Better understanding of the endocrine processes will lead to better and safer methods of pest control.

2. Scope of the Program

- Multistate Research
- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Juvenile hormone plays an important role in regulating reproductive physiology or behavior, or both.

2. Ultimate goal(s) of this Program

To understand the physiological control of the complex reproductive behavior, which includes elaborate parental care of burying beetles.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2009	0.0	0.0	0.5	0.0
2010	0.0	0.0	0.5	0.0
2011	0.0	0.0	0.0	0.0
2012	0.0	0.0	0.0	0.0
2013	0.0	0.0	0.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Manuscripts will be submitted to peer reviewed journals. Presentations will be given at regional, national and/or international meetings. Grant proposals will be submitted. There will be training of undergraduate students, graduate students and/or postdoctoral fellows. Beetles of several species will be trapped locally. Hemolymph will be taken at designated times and during a reproductive bout and will be analyzed using radioimmunoassay for juvenile hormone titers.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
• Other 2 (Laboratory research) • Other 1 (Field Researh)	• Other 1 (Peer reviewed publications)

3. Description of targeted audience

Target audience will include students in university classrooms, and scientists in behavioral ecology or behavioral endocrinology and agricultural pest research.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

Year	Direct Contacts Adults Target	Indirect Contacts Adults Target	Direct Contacts Youth Target	Indirect Contacts Youth Target
2009	50	50	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0

2. (Standard Research Target) Number of Patent Applications Submitted

Expected Patent Applications

2009 :0	**2010 :**0	**2011 :** 0	**2012 :**0	**2013 :**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	1	0	1
2010	1	0	1
2011	0	0	0
2012	0	0	0
2013	0	0	0

V(H). State Defined Outputs

1. Output Target

- Number of participants in the project (not including audience counts)

2009 :3	**2010 :**0	**2011 :** 0	**2012 :**0	**2013 :**0

- Number of undergraduate students directly involved in the projects

2009 :1	**2010 :**0	**2011 :** 0	**2012 :**0	**2013 :**0

- Number of graduate student directly involved in the projects

2009 :1	**2010 :**1	**2011 :** 0	**2012 :**0	**2013 :**0

- Number of university courses in which project results have been incorporated

2009 :1	**2010 :**1	**2011 :** 1	**2012 :**0	**2013 :**0

- Number of workshops and training sessions

2009 :1	**2010 :**0	**2011 :** 0	**2012 :**0	**2013 :**0

- Number of presentation at regional, national, or international scientific meetings

2009 :1	**2010 :**1	**2011 :** 0	**2012 :**0	**2013 :**0

- Number of book chapters written

2009 :0	**2010 :**0	**2011 :** 0	**2012 :**0	**2013 :**0

- Number of non-peer-reviewed publications (abstracts, newsletters, fact sheets, articles, etc)

2009 :1	**2010 :**1	**2011 :** 0	**2012 :**0	**2013 :**0

- Number of websites in which project results have been incorporated

2009 :1	**2010 :**1	**2011 :** 1	**2012 :**1	**2013 :**1

V(I). State Defined Outcome

O. No	Outcome Name
1	Increase in knowledge about hormonal control of reproduction and parental care in beetles (qualitative outcome statement)

Outcome #1

1. Outcome Target

Increase in knowledge about hormonal control of reproduction and parental care in beetles (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0	**2010 :** 0	**2011 :** 0	**2012 :** 0	**2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

●   215 - Biological Control of Pests Affecting Plants

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

●   Natural Disasters (drought,weather extremes,etc.)
●   Appropriations changes

Description

Natural disaster such as drought or floods would adversely affect the project, as would the loss of funding through appropriation changes.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

●   During (during program)
●   After Only (post program)

Description

 Effectiveness of the program will be assessed from annual reports and from comments and questions of manuscript and grant proposal reviewers and audiences at presentations.

2. Data Collection Methods

●   Sampling

Description

Data on program effectiveness will be collected from annual reports and from comments and questions of manuscript and grant proposal reviewers and audiences at presentations.

V(A). Planned Program (Summary)

Program #8

1. Name of the Planned Program

Plants & Plant Products

2. Brief summary about Planned Program

   The NHAES Plants & Plant Products program has five projects using a variety of methods and plant species to study various aspects of plant stress physiology. A number of other projects related to plant breeding and cultural practiced have been moved to the Sustainable Horticulture program described later. Project 1 is looking at the relationship between iron deficiency, oxidative stress and the inhibition of photosynthesis through laboratory experiments using green microalgae. Project 2 is assessing generalized stress response at the cellular and tissue level for sunflower leaves exposed to osmotic stress and mechanical injury. Project 3 is a molecular study to examine DNA damage from UV radiation in Arabidopsis thaliana. Project 4 is a molecular and biochemical study of the regulation of polyamine metabolism and stress response in poplar. Project 5 is a molecular study to elucidate the role of protein phosphatase 2A in auxin signaling and the root response to gravity.

3. Program existence :   Mature (More then five years)

4. Program duration :   Long-Term (More than five years)

5. Expending formula funds or state-matching funds :   Yes

6. Expending other than formula funds or state-matching funds :   Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
125	Agroforestry			8%	
201	Plant Genome, Genetics, and Genetic Mechanisms			19%	
202	Plant Genetic Resources			5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			38%	
206	Basic Plant Biology			30%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

   Abiotic stress in plants can lead to reduced crop yields, reduced survival of landscape plants, reduction of growth and photosynthesis of plants in fields, forests, salt marsh and the ocean, which in turn reduces CO2 uptake and carbon sequestration. Understanding the mechanism of stress response may lead to the development of stress resistant crop varieties. Understanding

the effects of stress response in wild plants allows for better modeling of global carbon dynamics.

Project 1. Iron scarcity in the oceans is known to be one of the two major limiting factors in primary productivity at the bottom of the food chain. The metabolic role of iron in both promoting and ameliorating oxidative stress is still poorly understood in photosynthetic organisms.

Project 2. A little studied aspect of plant stress response is that of cell and tissue structural response to general stresses such as mechanical stress. An overall understanding of plant responses to stress can affect the direction of plant breeding for enhanced resistance to various abiotic stresses.

Project 3. We seek to identify genetic mechanisms involved in plant responses to DNA damage (an abiotic stress) in the model plant Arabidopsis thaliana. These mechanisms will be characterized for a better understanding to their impact in crop-related species.
To better understand ways to improve crop species in response to abiotic stresses such as DNA damage.

Project 4. Understanding plant response to abiotic stress will lead to design and development of resistant varieties of plants, including trees. Also, plants could be designed for improved nutritional or agronomic features.
Project 5. The responses of plant root systems to environmental stress determines its ability to uptake nutrients and water and in turn its growth and general health.

2. Scope of the Program

- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Project 1.

-

We hypothesize that iron deficiency will adversely affect the key anti-oxidant enzymes: superoxide dismutase, catalase and ascorbate peroxidase.

-

We also suspect the it will cause a depletion of the key substrates ascorbic acid (vitamin C) and alpha-tocopherol (vitamin E).

Project 2.

-

Different plant stress detections pathways will converge on a very limited number of cytological and tissue structural responses.

Project 3.

-

We will find new mechanisms in plants involved in responses to abiotic stress.

-

 Arabidopsis will serve as an excellent model system for crop species.

Project 4

-

Hypothesis will be tested with respect to the integration of metabolic pathways in plants

-

Explanations for plat's response to abiotic stress will be found that will be widely applicable

Project 5.

-

That Protein Phosphatase 2A is involved in root responses through auxin signaling.

2. Ultimate goal(s) of this Program

The ultimate goal of the program is to enhance our understanding of plant responses to abiotic stress in hopes that this knowledge will lead to the development of plant varieties that are more resistant or technologies that improve plant resistance in improve crop production. Goals of the specific projects are as follows:

Project 1. To allow meaningful predictions of the quantitative effects of iron limitation on net primary productivity due to oxidative stress.

Project 2. To understand the involvement of cell and tissue structural changes in responses to plant stress and eventually the mechanism by which those changes are effected.

Project 3. Better crops, better understanding of the genetic mechanisms of plants.

Project 4. Understanding abiotic stress response in plants and the production of plant varieties that are tolerant to short term drought, salinity and heavy metals.

Project 5. To understand the role of protein phosphatases in plant stress responses.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2009	0.0	0.0	1.3	0.0
2010	0.0	0.0	1.3	0.0
2011	0.0	0.0	1.3	0.0
2012	0.0	0.0	1.3	0.0
2013	0.0	0.0	0.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Project 1 will conduct laboratory studies to investigate the role of iron deficiency in altering and reducing the efficiency of anti-oxidant sysstems in limiting damage and stress to photosynthesis. It will test a variety of photosynthetic marine micro-organisms at a range of iron levels, determine photosynthetic sensitivities, antioxidant levels and responses.

Project 2 will conduct greenhouse, field and laboratory experiments to determine whether plants have a generalized response to abiotic stress at the cellular and tissue level. Papers will be published in peer reviewed journals describing results of these studies as well as presentations at scientific meetings. A web site specific to this project will be developed.

Project 3 will carry out laboratory molecular studies to identify genetic mechanisms involved in plant responses to DNA damage (an abiotic stress) in the model plant Arabidopsis thaliana. Undergraduate training and teaching, through understanding of the genetic mechanisms in response to DNA damage. Research will be presented at local and national meetings, published in peer and non-peer reviewed journals, graduate student training as above.

Project 4 will use laboratory analyses to identify the effects of genetic manipulation of plant metabolism on biochemical and molecular changes in the plant cells and relate that to cell's response to abiotic stress and specifically to Identify the mechanisms of regulation of amino acid and polyamine metabolism. Results will be publish in refereed journals and book chapters. Results will be used in teaching undergraduate and graduate students. And used in outreach activity with high school students and teachers.

Project 5. Will conduct growth chamber and molecular biological studies to assess the effects of stress and the role of protein phosphatases on the response of roots to gravity. Undergraduate and graduate student participants will be trained the techniques of biotechnology and genetic analyses.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
- Education Class - Other 2 (Scientific presentations) - Demonstrations - Other 1 (Laboratory research) - Group Discussion	- Newsletters - Other 1 (Peer reviewed publications) - Web sites

3. Description of targeted audience

At this stage, the projects in this program are primarily basic science, although the ultimate applications are clear. As basic research, the main target audience includes other scientists in the discipline, graduate and undergraduate students. Project 1 would be of interest to researchers dealing with micronutirent deficiences and their effects on photosynthetic productivity. Project 2 would be of interest to other scientists in plant stress biology and plant physiology and potentially plant breeders interested in abiotic stress in plants.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2009	400	1500	10	0
2010	400	1500	10	0
2011	400	1500	10	0
2012	400	1500	10	0
2013	400	1500	0	0

2. (Standard Research Target) Number of Patent Applications Submitted

Expected Patent Applications

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	5	0	5
2010	5	0	5
2011	5	0	5
2012	5	0	5
2013	0	0	0

V(H). State Defined Outputs

1. Output Target

- Number of participants directly involved in the project (not including audience counts, workshop participants, survey respondents, etc)

  2009 :15   **2010** :15   **2011** : 15   **2012** :15   **2013** :15

- Number of undergraduate students directly involved in the projects

  2009 :5   **2010** :5   **2011** : 5   **2012** :5   **2013** :5

- Number of graduate student directly involved in the projects

  2009 :5   **2010** :5   **2011** : 5   **2012** :5   **2013** :5

- Number of university courses in which project results have been incorporated

  2009 :5   **2010** :5   **2011** : 5   **2012** :5   **2013** :5

- Number of workshops and training sessions

  2009 :0   **2010** :0   **2011** : 0   **2012** :0   **2013** :0

- Number of presentation at regional, national, or international scientific meetings

  2009 :5   **2010** :5   **2011** : 5   **2012** :5   **2013** :5

- Number of book chapters written

  2009 :1   **2010** :1   **2011** : 1   **2012** :1   **2013** :1

- Number of non-peer-reviewed publications (abstracts, newsletters, fact sheets, articles, etc)

  2009 :8   **2010** :8   **2011** : 8   **2012** :8   **2013** :8

- Number of websites in which project results have been incorporated

  2009 :3   **2010** :3   **2011** : 3   **2012** :3   **2013** :2

V(I). State Defined Outcome

O. No	Outcome Name
1	Increased knowledge about the relationship between iron deficiency, oxidative stress and the inhibition of photosynthesis (quantitative outcome statement)
2	Increased knowledge about generalized stress response at the cellular and tissue level for leaves exposed to osmotic stress and mechanical injury (quantitative outcome statement)
3	Increased knowledge about DNA damage from UV radiation in Arabidopsis thaliana (quantitative outcome statement)
4	Increased knowledge about the regulation of polyamine metabolism and stress response in poplar (quantitative outcome statement)
5	Increased knowledge about the role of protein phosphatase in auxin signaling and root response to gravity (quantitative outcome statement)

Outcome #1

1. Outcome Target

Increased knowledge about the relationship between iron deficiency, oxidative stress and the inhibition of photosynthesis (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

- 206 - Basic Plant Biology

Outcome #2

1. Outcome Target

Increased knowledge about generalized stress response at the cellular and tissue level for leaves exposed to osmotic stress and mechanical injury (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

- 202 - Plant Genetic Resources

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

- 206 - Basic Plant Biology

Outcome #3

1. Outcome Target

Increased knowledge about DNA damage from UV radiation in Arabidopsis thaliana (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

- 206 - Basic Plant Biology

Outcome #4

1. Outcome Target

Increased knowledge about the regulation of polyamine metabolism and stress response in poplar (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

| **2009 :** 0 | **2010 :** 0 | **2011 :** 0 | **2012 :** 0 | **2013 :** 0 |

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 125 - Agroforestry

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

- 202 - Plant Genetic Resources

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

- 206 - Basic Plant Biology

Outcome #5

1. Outcome Target

Increased knowledge about the role of protein phosphatase in auxin signaling and root response to gravity (quantitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

| **2009 :** 0 | **2010 :** 0 | **2011 :** 0 | **2012 :** 0 | **2013 :** 0 |

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

- 206 - Basic Plant Biology

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Competing Programatic Challenges
- Appropriations changes
- Economy

Description

For any field research in agriculture, extreme and/or anomalous weather conditions or natural disasters can produce atypical results that require changes in planned research methodology.

Change in the economy can change regional priorities and necessitate refocusing research.

The success of the research is dependent on continued NHAES funding at a sufficient level.

Change in NHAES research priorities through strategic planning and advisory group input might result in a rebalancing of

competing programmatic investment.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)
- Retrospective (post program)
- Time series (multiple points before and after program)
- After Only (post program)

Description

Evaluation of work will be based on peer review acceptance of manuscripts and papers, industry acceptance and application of results. . During each project, data are analyzed and research is evaluated.

2. Data Collection Methods

- Journals
- Other (Reviews)
- Sampling
- Observation

Description

Feedback from target audiences (other scientists, students, etc) will be collected through questions and comments at meetings, proposal and manuscript reviews, and website stakeholder input tools.

V(A). Planned Program (Summary)

Program #9

1. Name of the Planned Program

Sustainable Horticulture

2. Brief summary about Planned Program

Horticulture is the fastest growing and largest segment of the Agricultural industry in New Hampshire. The Agriculture Strategic Plan currently being developed by the UNH College of Life Sciences and Agriculture and the NHAES has established Horticulture as a priority area for the development of integrated teaching, research and outreach programs and will recommend resource investment in these programs. While many of the components of Horticulture are included in the Planned Programs of standard National Emphasis Areas, the NHAES has chosen to bring the Horticultural projects together in a single integrated state defined Planned Project. Many of the individual projects in the program have existed for a number of years, others are relatively new.

3. Program existence :   Mature (More then five years)

4. Program duration :   Long-Term (More than five years)

5. Expending formula funds or state-matching funds :   Yes

6. Expending other than formula funds or state-matching funds :   Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			2%	
201	Plant Genome, Genetics, and Genetic Mechanisms			12%	
202	Plant Genetic Resources			10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			10%	
204	Plant Product Quality and Utility (Preharvest)			14%	
205	Plant Management Systems			14%	
206	Basic Plant Biology			4%	
212	Pathogens and Nematodes Affecting Plants			4%	
216	Integrated Pest Management Systems			2%	
502	New and Improved Food Products			5%	
503	Quality Maintenance in Storing and Marketing Food Products			4%	
701	Nutrient Composition of Food			15%	
901	Program and Project Design, and Statistics			2%	
903	Communication, Education, and Information Delivery			2%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Horticulture is the fastest growing and largest segment of the Agricultural industry in New Hampshire. Horticulture in New England encompasses greenhouse production of ornamentals, nursery production of shrubs and trees, and fruit & vegetable production. A priority of the NHAES is to support the development of an economically and environmental sustainable horticulture industry in New Hampshire and the region through basic and applied research, education and outreach.

Compared to some other regions, Horticulture in New Hampshire faces the challenge of a short growing season and cold winter climate. New England farms are relatively small and diversified.

Research projects in the NHAES have and will continue to focus on issues relevant to these regional challenges. Fruit and vegetable breeding programs focus on developing varieties that are well suited for New England. Development and field testing of season extension technology such as row covers, mulches, high tunnels was pioneered at the NHAES. Over-wintering methods for container-grown nursery stock are be tested and refined to reduce labor costs and increase profitability in wholesale and retail nurseries

2. Scope of the Program

- In-State Extension
- Multistate Extension
- Integrated Research and Extension
- Multistate Research
- In-State Research
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

-

Horticulture will continue to be the largest Agriculture sector in New Hampshire

-

Growers, farmers and home gardeners will continue to be challenged by New England climate, by increasing energy costs, and by insect pests and plant diseases.

-

The preference of consumers for more nutritious fruit and vegetables that are locally grown using sustainable practices will continue to increase.

-

The NHAES researches will be able to continue to develop and deliver solutions for these issues.

2. Ultimate goal(s) of this Program

The ultimate goal is to develop a program that integrates basic and applied research, education and outreach and responds effectively to the needs of the horticulture industry, the University, and consumers.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2009	0.0	0.0	2.4	0.0
2010	0.0	0.0	2.4	0.0
2011	0.0	0.0	2.9	0.0
2012	0.0	0.0	2.9	0.0
2013	0.0	0.0	2.9	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

There are five ongoing Horticulture research projects. Three are aimed at development of fruit and vegetable varieties with increase nutritional quality, better seasonality, and improved cultural characteristics that make them superior for New England production. The first project is utilizing genomic tools to guide a breeding program for strawberries and mint. The project uses a combination of laboratory molecular analyses, bioinformatics, greenhouse experiments and breeding, and field trials to develop and test new varieties. The second project will continue a long-term breeding that has led to the development of new varieties of melons and squash, many of which are in commercial production. The project is part of a multi-state effort to conserve and utilize plant genetic resources. Activities will include field breeding and field trials to select for commercially important characteristic in melons, squash, pumpkins and gourds. A directly related third project will use the same breeding methodology specifically to improve nutritional quality of squash. The study will use laboratory nutritional analyses to guide the breeding work and assess the results. The fourth project will use a series of field trials to assess the effectiveness of row covers, high tunnels and mulch for season extension and insect & diseases prevention in blackberries, sweet peppers, and sweet potatoes. Field variety trials will also be conducted for cantaloupes and sweet potatoes to determine varieties that optimum for northern climates. Quality assessments will be done via laboratory analyses and blind taste tests. The study will also evaluate Winter Sprouting Broccoli as a new crop for New England. A goal of the project is increase grower awareness of new crops and varieties that increase diversity and profitability. Workshops will be held for growers. The fifth project will continue to assess cultural factors that influence production and landscape establishment of trees and shrubs. One component of the project is to develop and compare methods of over-wintering container-grow shrubs and trees. Available and experimental products will be tested in the field. Root zone temperature will be continual recorded with data loggers. Root damage will be assessed in the spring and general health and growth will be monitored after planting in the landscape. Results will be presented to nurserymen and landscapers via workshops and publications.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
• Education Class • Workshop • Demonstrations	• Newsletters • Web sites

3. Description of targeted audience

Fruit and vegetable growers throughout New England and the Northeast are the primary target, along with home gardeners and consumers of local farm products. Nursery owners, managers and growers in the state and region. Other researchers and undergraduate and graduate students in horticulture and sustainable agriculture.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

Year	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
	Target	Target	Target	Target
2009	300	500	0	200
2010	300	500	0	200
2011	300	500	0	200
2012	200	500	0	200
2013	200	500	0	200

2. (Standard Research Target) Number of Patent Applications Submitted

Expected Patent Applications

2009 :0   **2010 :**0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	5	0	5
2010	5	0	5
2011	3	0	3
2012	3	0	3
2013	3	0	0

V(H). State Defined Outputs

1. Output Target

- Number of workshops and training sessions

  2009 :4   **2010 :**4   **2011 :** 4   **2012 :**4   **2013 :** 4

- Number of participants in the project (not including audience counts)

  2009 :10   **2010 :**10   **2011 :** 10   **2012 :**10   **2013 :** 10

- Number of undergraduate students involved in the research projects

  2009 :5   **2010 :**5   **2011 :** 5   **2012 :**5   **2013 :** 5

- Number of graduate students involved in the research project

  2009 :2   **2010 :**2   **2011 :** 2   **2012 :**2   **2013 :** 2

- Number of university courses in which the results have project results have been incorporated

2009 :3   **2010** :3   **2011** : 3   **2012** :3   **2013** :3

- Number of presentations at regional, national or international scientific meetings

2009 :4   **2010** :4   **2011** : 3   **2012** :2   **2013** :2

- Number of book chapters written

2009 :0   **2010** :0   **2011** : 0   **2012** :0   **2013** :0

- Number of non-peer reviewed publications (abstracts, newsletters, fact sheets, articles, etc)

2009 :2   **2010** :2   **2011** : 2   **2012** :2   **2013** :2

- Number of websites in which the project results are incorporated.

2009 :2   **2010** :2   **2011** : 2   **2012** :2   **2013** :2

V(I). State Defined Outcome

O. No	Outcome Name
1	Improvement in nutritional and cultural quality of fruit and vegetable varieties produced by breeding programs. (qualitative outcome statement)
2	Suitability of varieties tested in field trials (qualitative outcome statement)
3	Effectiveness of season extension and pest/disease control methods for which field trials were completed (qualitative outcome statement)
4	Effectiveness of genomic tools used to guide breeding program (qualitative outcome statement)
5	Effectiveness of workshops and other presentation in informing growers and consumers about new varieties (qualitative outcome statement)
6	Effectiveness of undergraduate and graduate student training through project participation and classroom presentation. (qualitative outcome statement)
7	Overall effectiveness of the Planned Program in addressing issues and needs of the state and region (qualitative outcome statement)

Outcome #1

1. Outcome Target

Improvement in nutritional and cultural quality of fruit and vegetable varieties produced by breeding programs. (qualitative outcome statement)

2. Outcome Type :   Change in Condition Outcome Measure

| **2009 :** 0 | **2010 :** 0 | **2011 :** 0 | **2012 :** 0 | **2013 :** 0 |

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 202 - Plant Genetic Resources

● 204 - Plant Product Quality and Utility (Preharvest)

● 212 - Pathogens and Nematodes Affecting Plants

● 216 - Integrated Pest Management Systems

● 502 - New and Improved Food Products

● 503 - Quality Maintenance in Storing and Marketing Food Products

● 701 - Nutrient Composition of Food

Outcome #2

1. Outcome Target

Suitability of varieties tested in field trials (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

| **2009 :** 0 | **2010 :** 0 | **2011 :** 0 | **2012 :** 0 | **2013 :** 0 |

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 202 - Plant Genetic Resources

● 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

● 204 - Plant Product Quality and Utility (Preharvest)

● 212 - Pathogens and Nematodes Affecting Plants

● 216 - Integrated Pest Management Systems

● 502 - New and Improved Food Products

● 503 - Quality Maintenance in Storing and Marketing Food Products

● 701 - Nutrient Composition of Food

Outcome #3

1. Outcome Target

Effectiveness of season extension and pest/disease control methods for which field trials were completed (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 102 - Soil, Plant, Water, Nutrient Relationships

● 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

● 212 - Pathogens and Nematodes Affecting Plants

● 216 - Integrated Pest Management Systems

Outcome #4

1. Outcome Target

Effectiveness of genomic tools used to guide breeding program (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 201 - Plant Genome, Genetics, and Genetic Mechanisms

● 202 - Plant Genetic Resources

● 204 - Plant Product Quality and Utility (Preharvest)

● 502 - New and Improved Food Products

Outcome #5

1. Outcome Target

Effectiveness of workshops and other presentation in informing growers and consumers about new varieties (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

● 204 - Plant Product Quality and Utility (Preharvest)

● 206 - Basic Plant Biology

● 212 - Pathogens and Nematodes Affecting Plants

● 216 - Integrated Pest Management Systems

● 502 - New and Improved Food Products

● 503 - Quality Maintenance in Storing and Marketing Food Products

- 701 - Nutrient Composition of Food

- 903 - Communication, Education, and Information Delivery

Outcome #6

1. Outcome Target

Effectiveness of undergraduate and graduate student training through project participation and classroom presentation. (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

- 202 - Plant Genetic Resources

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

- 204 - Plant Product Quality and Utility (Preharvest)

- 205 - Plant Management Systems

- 206 - Basic Plant Biology

- 212 - Pathogens and Nematodes Affecting Plants

- 216 - Integrated Pest Management Systems

- 502 - New and Improved Food Products

- 503 - Quality Maintenance in Storing and Marketing Food Products

- 701 - Nutrient Composition of Food

- 901 - Program and Project Design, and Statistics

- 903 - Communication, Education, and Information Delivery

Outcome #7

1. Outcome Target

Overall effectiveness of the Planned Program in addressing issues and needs of the state and region (qualitative outcome statement)

2. Outcome Type :   Change in Condition Outcome Measure

2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

- 202 - Plant Genetic Resources

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

- 204 - Plant Product Quality and Utility (Preharvest)

- 205 - Plant Management Systems

- 206 - Basic Plant Biology

- 212 - Pathogens and Nematodes Affecting Plants

- 216 - Integrated Pest Management Systems

- 502 - New and Improved Food Products

- 503 - Quality Maintenance in Storing and Marketing Food Products

- 701 - Nutrient Composition of Food

- 901 - Program and Project Design, and Statistics

- 903 - Communication, Education, and Information Delivery

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought,weather extremes,etc.)
- Appropriations changes
- Economy

Description

The success of fruit and vegetable breeding programs and field trials of new and existing varieties are highly dependant upon weather. For example, a sweet potato variety that does well in an exceptionally warm year, may not perform as well in an average year. A cool, damp growing season may make impossible to assess the effectiveness of partial powdery mildew resistance in squash or pumpkins.

Change in the economy can change regional priorities and necessitate refocusing research.

The success of the research is dependent on continued NHAES funding at a sufficient level.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Other (see below)
- After Only (post program)
- During (during program)

Description

The Horticulture program will be evaluated based on accomplishment of its research goals and on how well it has address the issues and met the needs of its target audience. Feedback from growers groups, the NHAES External Advisory Committee and other stakeholders during and after the studies will be considered.

2. Data Collection Methods

- Other (meetings & website)
- Sampling
- Observation
- Unstructured

Description

    Feedback from target audiences (growers, nursery professionals, landscapers, seed companies, home gardeners, etc) will be collected through meetings and website stakeholder input tools.

V(A). Planned Program (Summary)

Program #10

1. Name of the Planned Program

Sustainable Marine Aquaculture & Fisheries

2. Brief summary about Planned Program

The global demand for seafood has increased steadily, while for the past 18 years, the amount of seafood harvested from wild populations has remained level or declined. Increased demand has been met entirely through marine aquaculture, which is presently a multi-billion dollar industry. The United States is a major consumer of marine aquaculture products, yet we grow only a tiny fraction of global production and indeed only a small fraction of what we consume. A significant obstacle to the growth of a U.S. marine aquaculture industry has been the need to find environmentally sustainable methods of farming fish. Part of the issue is that marine aquaculture operations in the Northeast have focused on finfish production (mostly salmon) in coastal net-pen systems. There are nutrient discharge issues, protein source issues, disease issues and a number of other concerns. The goal of the Sustainable Aquaculture & Marine Fisheries Program is to find solutions to the issues and lay the groundwork for the growth of the industry in the Northeast.

3. Program existence :   Mature (More then five years)

4. Program duration :   Long-Term (More than five years)

5. Expending formula funds or state-matching funds :   Yes

6. Expending other than formula funds or state-matching funds :   Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
135	Aquatic and Terrestrial Wildlife			13%	
204	Plant Product Quality and Utility (Preharvest)			8%	
301	Reproductive Performance of Animals			13%	
302	Nutrient Utilization in Animals			7%	
304	Animal Genome			8%	
305	Animal Physiological Processes			22%	
307	Animal Management Systems			8%	
308	Improved Animal Products (Before Harvest)			2%	
311	Animal Diseases			13%	
315	Animal Welfare/Well-Being and Protection			3%	
403	Waste Disposal, Recycling, and Reuse			3%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

New England has the natural resources to support a strong, economically and environmentally sustainable marine aquaculture industry and fishery, but it has not yet adopted the correct approach. The problem is that the marine aquaculture industry in the Northeast, and indeed in much of North America, has been interested primarily in growing fish, and very few species of fish at that. In addition to the tremendous financial risk of basing an industry on a single species, the production of fish creates several environmental problems. One is that fish, like any animal, produce metabolic waste. In coastal waters, the nutrient in fish aquaculture effluent can create environmental problems including blooms of toxic and nuisance algae. Secondly, aquaculture fish feed contains high levels of protein (~50%). The protein source for marine fish diets is fishmeal, which general comes from wild harvested sardines and anchovies. These fisheries are fully exploited and will not support the project global growth of aquaculture.

So there is a need for alternate, sustainable sources of protein. There are also disease issues that can be devastating to an aquaculture industry build on one or few species. The key to a sustainable marine aquaculture industry is diversification and the integration of fed species, like fish with extractive species, like mollusks and commercially important seaweeds.

Capture marine fisheries in the Northeast overall have declined significantly since the mid-1900s. One salient exception is the New England lobster industry. Commercial landings of lobster from the Gulf of Maine have doubled since 1981 and are now at 35,000 Metric Tonnes per year. Part of the success is the result of good fishery management based on scientific knowledge. Some of this knowledge has come from ongoing NHAES supported research.

The priorities of the NHAES are to support research and technology development that leads to diversification and development of sustainable marine aquaculture systems and good management practices for marine fisheries.

2. Scope of the Program

- Multistate Research
- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

-
The global and local demand for seafood will continue to increase
-
Consumer demand for locally produced foods will continue to increase
-
Increased demand will need to be met through marine aquaculture
-
Aquaculture in the Northeast must be economically and environmental sustainable
-
Sustainability can be achieved through integrated multi-trophic aquaculture (IMTA)
-
Significant research and technology is needed, especially on extractive IMTA components (seaweeds and bivalves)
-
Continued growth of lobster fisheries and recovery of other marine fisheries in the Northeast require good management that is based on sound research

2. Ultimate goal(s) of this Program

The ultimate goal of the program is to provide research and develop technology that will allow the establishment of a strong integrated multi-trophic aquaculture industry in the Northeast, and to provide research that leads to effective management of marine fisheries.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2009	0.0	0.0	1.6	0.0
2010	0.0	0.0	1.6	0.0
2011	0.0	0.0	1.6	0.0
2012	0.0	0.0	1.6	0.0
2013	0.0	0.0	1.6	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

There will be seven projects in the NHAES Sustainable Marine Aquaculture and Fisheries program. The first project will look at stock-specific growth characteristics of Atlantic cod from the Gulf of Maine in order to optimize genotype selections and genetic diversity for aquaculture. The fish component of marine aquaculture in the North Atlantic has historically been salmon. Atlantic cod have great potential as they can be grown using the same methods and net-pen enclosures that have been used for salmon. There is a high demand for cod and there is one existing hatchery for cod in the Northeast, Great Bay Aquaculture, LLC in Portsmouth, NH. GBA will be a participant in the study. Spawning cod from distinct spring and winter populations will be capture from the wild and genotyped using molecular analyses. Juvenile cod (15g) will be produced from each population and grown in recirculating aquaculture tanks at three different temperatures. Feed intake, growth rates and feed conversion rates will be determined and compared. The experiment will be repeated with larger fish (100g). Two studies will focus on extractive aquaculture components. In an integrated aquaculture system, sea urchins can be used to remove nutrients that are produced by the fed components. Seaweeds and microalgae take up nutrient excreted by fish and use them for protein production and growth, sea urchins eat algae and use nutrients growth. When the urchins are harvested, the nutrients are removed from the system. The sea urchin project will use laboratory and field studies to refine methods of promoting juvenile growth rates and increasing out-planting success. Another project will develop seaweed culture methods to mass produce sporeling (small plant) for grow-out in intergrated aquaculture systems. Asian aquaculture supports a number of seaweed "hatcheries" that supply lines and nets seeded with tiny seaweed sporelings. No such facility exists in the U.S. The project will isolate two commercially important native seaweed species from the field and carry out laboratory culture experiments to determine the optimum conditions to promote reproduction. Culture methods will be developed that can be adapted to a commercial scale. Bivalves such as oysters, mussels and clam, are filter feeders and are another important extractive component in integrated aquaculture. Three projects focus on diseases that effect bivalves. Two will examine Vibrio bacterial infections that affect oysters and ultimately present a health hazard to consumers. One project will develop and refine methods for detecting Vibrio in oysters and will conduct field tests under different environmental and water quality conditions to determine situations where infections are most likely. The second is a laboratory study of the mechanism by which host adaptive evolution and host-range expansion occurs in Vibrio. The third project is a study of leukemia in soft-shell clams and its implications for the New England shellfish industry. The project will use laboratory studies to study the disease at the molecular level. New knowledge will be disseminated to the shellfish industry through presentations at the Maine Fishermen's Forum and interactions with Spinny Creek Shellfish. The last project in the Program is an ongoing study of movement of lobsters in response to thermal gradients. It will lead to a better understanding of migration patterns and ultimately to better management of lobster fisheries. The project will use a combination of laboratory studies and field monitoring using electronic tracking, underwater observation via SCUBA and remote video.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
• Workshop • Education Class • Group Discussion • Other 1 (Field & Lab research) • Demonstrations • Other 2 (Scientific Presentations)	• TV Media Programs • Web sites

3. Description of targeted audience

The target audience for the basic research components of the project include other scientists in the discipline, graduate and undergraduate students. The applied research components are also important to aquaculture operations, marine ecologists and conservation groups, regulatory agency (EPA, NMFS, NHDES), lobstermen, shellfish harvesters, and consumers.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

Year	Direct Contacts Adults Target	Indirect Contacts Adults Target	Direct Contacts Youth Target	Indirect Contacts Youth Target
2009	200	1000	20	100
2010	200	1000	15	100
2011	100	1000	0	0
2012	0	0	0	0
2013	0	0	0	0

2. (Standard Research Target) Number of Patent Applications Submitted

Expected Patent Applications

2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	7	0	7
2010	7	0	7
2011	4	0	4
2012	2	0	2
2013	2	0	2

V(H). State Defined Outputs

1. Output Target

- Number of participants in the project (not including audience counts)

  2009 : 16   **2010 :** 16   **2011 :** 10   **2012 :** 10   **2013 :** 10

- Number of undergraduate students directly involved in the projects

  2009 : 5   **2010 :** 5   **2011 :** 3   **2012 :** 3   **2013 :** 2

- Number of graduate student directly involved in the projects

  2009 : 4   **2010 :** 4   **2011 :** 2   **2012 :** 2   **2013 :** 2

- Number of university courses in which project results have been incorporated

  2009 : 5   **2010 :** 5   **2011 :** 5   **2012 :** 5   **2013 :** 5

- Number of workshops and training sessions

  2009 : 2   **2010 :** 3   **2011 :** 3   **2012 :** 2   **2013 :** 2

- Number of presentation at regional, national, or international scientific meetings

2009 :7   **2010** :7   **2011** : 7   **2012** :7   **2013** :7

- Number of book chapters written

  2009 :1   **2010** :0   **2011** : 0   **2012** :0   **2013** :0

- Number of non-peer-reviewed publications (abstracts, newsletters, fact sheets, articles, etc)

  2009 :8   **2010** :8   **2011** : 5   **2012** :5   **2013** :5

- Number of websites in which project results have been incorporated.

  2009 :4   **2010** :4   **2011** : 4   **2012** :4   **2013** :4

V(I). State Defined Outcome

O. No	Outcome Name
1	Increased knowledge of stock-specific growth characteristics in Atlantic cod (qualitative outcome statement)
2	Incorporation of stock-specific growth characteristics knowledge into commercial aquaculture (qualitative outcome statement)
3	Increased knowledge of juvenile sea urchin growth rates and out-planting success (qualitative outcome statement)
4	Increased knowledge of seaweed culture conditions required to promote reproduction (qualitative outcome statement)
5	Advances in scalable technology for production of seaweed sporelings (qualitative outcome statement) Enhanced knowledge about lobster behavior, ecology and population dynamics (qualitative outcome statement)
6	Improvements in detections methods for Vibrio infections in oysters (qualitative outcome statement)
7	Increased understanding of the relationship between environmental conditions and Vibrio infections in oysters (qualitative outcome statement)
8	Increased understanding of the mechanism of host adaptive evolution and host-range expansion in Vibrio (qualitative outcome statement)
9	Increased understanding of the molecular basis for leukemia in soft-shelled clams (qualitative outcome statement)
10	Increased knowledge of clam leukemia within the shellfish industry (qualitative outcome statement)
11	Overall enhancement of technology and knowledge in support of sustainable marine aquaculture and fisheries management (qualitative outcome statement)

Outcome #1

1. Outcome Target

Increased knowledge of stock-specific growth characteristics in Atlantic cod (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

| **2009 :** 0 | **2010 :** 0 | **2011 :** 0 | **2012 :** 0 | **2013 :** 0 |

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 304 - Animal Genome
- 305 - Animal Physiological Processes
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)

Outcome #2

1. Outcome Target

Incorporation of stock-specific growth characteristics knowledge into commercial aquaculture (qualitative outcome statement)

2. Outcome Type :   Change in Condition Outcome Measure

| **2009 :** 0 | **2010 :** 0 | **2011 :** 0 | **2012 :** 0 | **2013 :** 0 |

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 304 - Animal Genome
- 305 - Animal Physiological Processes
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)

Outcome #3

1. Outcome Target

Increased knowledge of juvenile sea urchin growth rates and out-planting success (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

    2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 302 - Nutrient Utilization in Animals
- 305 - Animal Physiological Processes
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)

Outcome #4

1. Outcome Target

Increased knowledge of seaweed culture conditions required to promote reproduction (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

    2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)
- 302 - Nutrient Utilization in Animals
- 403 - Waste Disposal, Recycling, and Reuse

Outcome #5

1. Outcome Target

Advances in scalable technology for production of seaweed sporelings (qualitative outcome statement) Enhanced knowledge about lobster behavior, ecology and population dynamics (qualitative outcome statement)

2. Outcome Type :   Change in Condition Outcome Measure

    2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)
- 302 - Nutrient Utilization in Animals
- 403 - Waste Disposal, Recycling, and Reuse

Outcome #6

1. Outcome Target

Improvements in detections methods for Vibrio infections in oysters (qualitative outcome statement)

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2. Outcome Type :   Change in Condition Outcome Measure

   2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 304 - Animal Genome
- 311 - Animal Diseases

Outcome #7

1. Outcome Target

Increased understanding of the relationship between environmental conditions and Vibrio infections in oysters (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

   2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 304 - Animal Genome
- 311 - Animal Diseases

Outcome #8

1. Outcome Target

Increased understanding of the mechanism of host adaptive evolution and host-range expansion in Vibrio (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

   2009 :0   **2010 :** 0   **2011 :** 0   **2012 :**0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 304 - Animal Genome
- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection

Outcome #9

1. Outcome Target

Increased understanding of the molecular basis for leukemia in soft-shelled clams (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

   2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 304 - Animal Genome
- 308 - Improved Animal Products (Before Harvest)
- 311 - Animal Diseases

Outcome #10

1. Outcome Target

Increased knowledge of clam leukemia within the shellfish industry (qualitative outcome statement)

2. Outcome Type :   Change in Knowledge Outcome Measure

   2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 304 - Animal Genome
- 308 - Improved Animal Products (Before Harvest)
- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection

Outcome #11

1. Outcome Target

Overall enhancement of technology and knowledge in support of sustainable marine aquaculture and fisheries management (qualitative outcome statement)

2. Outcome Type :   Change in Condition Outcome Measure

   2009 : 0   **2010 :** 0   **2011 :** 0   **2012 :** 0   **2013 :** 0

3. Associated Institute Type(s)

•1862 Research

4. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 204 - Plant Product Quality and Utility (Preharvest)
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 304 - Animal Genome

- 305 - Animal Physiological Processes

- 307 - Animal Management Systems

- 308 - Improved Animal Products (Before Harvest)

- 311 - Animal Diseases

- 315 - Animal Welfare/Well-Being and Protection

- 403 - Waste Disposal, Recycling, and Reuse

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Appropriations changes
- Public Policy changes
- Natural Disasters (drought,weather extremes,etc.)
- Economy
- Government Regulations

Description

The success of aquaculture operations and marine fishery health are dependant upon weather. For example, massive die-offs of lobsters in Long Islands sound were caused in par by climatic conditions. Super-chilled water due to extreme weather was responsible for mass mortality of salmon in aquaculture operations.

Aquaculture and marine fisheries are under government regulation. Consequently, changes in public policy or regulations may necessitate, or at least suggest, modifications in research goals.

Change in the economy can change regional priorities and necessitate refocusing research.

The success of the research is dependent on continued NHAES funding at a sufficient level.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)
- Retrospective (post program)
- After Only (post program)
- Other (see below)
- Before-After (before and after program)

Description

The Sustainable Marine Aquaculture and Fisheries program will be evaluated based on accomplishment of its research goals and on how well it has address the issues and met the needs of its target audience. Feedback from scientists, aquaculture operations, regulatory agencies, the NHAES External Advisory Committee and other stakeholders will be considered.

2. Data Collection Methods

- Sampling
- Other (meeting & website)
- Observation
- Unstructured

Description

 Feedback from target audiences (fish hatcheries, aquaculture operations, regulatory agencies, other scientists, students,

etc) will be collected through questions and comments at meetings, proposal and manuscript review, and website stakeholder input tools.